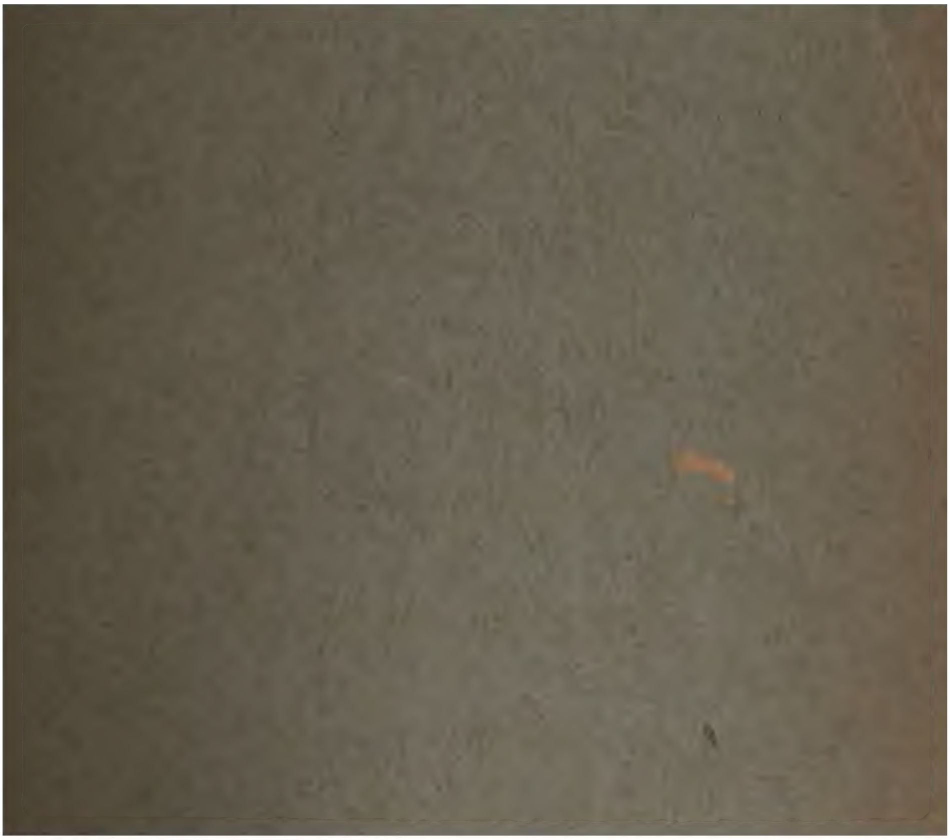

United States Naval Institute
Proceedings

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BATTERY BOMFORD, OCT. 25, 1910. SECOND TRIAL 12" SHOT, SERVICE PRACTICE, FIXED TARGET, RANGE 8070 YARDS.

The photograph shows the projectile at the moment of reentering the water point down after having skimmed the surface for a distance of 90 ft. Photographed from tug by Private Geo. Doane, 123 Co., C. A. C., Student Department Enlisted Specialists, Coast Artillery School. Published by permission of the Chief of Artillery, U. S. Army

Vol. 37, No. 1 March, 1911 Whole No. 137

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Proceedings

PUBLISHED QUARTERLY
EDITED BY PHILIP R. ALGER

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ANNAPOLIS — MARYLAND

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UNITED STATES NAVAL INSTITUTE
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Vol. 37, No. 1. **MARCH, 1911.** **Whole No. 137.**

NOTICE.

The Prize Essay and one of two essays awarded Honorable Mention appear in this issue. Discussion is invited, to be published in the June number. The other Honorable Mention essay will appear in the June number.

Beginning with this number, the PROCEEDINGS will be printed on paper which, for the same number of pages, bulks only about 40 per cent of that hitherto used. It is hoped that this will be found an improvement.

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Special attention is called to the fact that beginning with this year membership dues are reduced from $3.00 to $2.00, and the cost of subscription for non-members from $3.50 to $3.00 per annum, with an additional charge of 50 cents, in the latter case, when the PROCEEDINGS are delivered outside of the United States.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PRIZE ESSAY.

NAVY YARD ECONOMY.

By PAYMASTER CHARLES CONARD, U. S. Navy.

"If it were done when 'tis done, then 'twere well it were done quickly."

INTRODUCTION.

To those who have followed the numerous discussions of navy yard industrial methods during the last few years, and who have been interested in the changes and developments which have been taking place, it must have been apparent that there is considerable indefiniteness surrounding the claims and counter-claims for the various systems of management and administration, so far as the ability to prove, on the part of adherents of the plans adopted or proposed, that their methods do or would produce the most economical and satisfactory results. Of the methods actually tried it may be said that while great improvements over the old *laissez-faire* policy have undoubtedly been effected, it has been most difficult to show specifically where and to just what degree economies have resulted.

For every advocate of one plan who cites figures and instances to prove the efficiency of the work done while his system was in vogue there instantly appears an opponent who not only produces other figures and instances to strengthen his arguments, but who also proceeds to cast considerable doubt on the accuracy of the figures on which the first gentleman's arguments were

based. Thus the impartial observer—if there be any such—is apt to be somewhat confused.

It is the purpose of the writer of this essay to outline a few of the necessary elements of administration and accounts which he believes would, if adopted, largely obviate the difficulties referred to, and render it possible to obtain a better standard of comparison among any and all methods which may be tried. No consistent or detailed description of an administration and accounting system as a whole will be attempted. A certain familiarity with the present methods of our navy yards will be assumed, and remarks will be confined solely to those particulars wherein improvements are recommended.

Readjustments of navy yard organizations and new distributions of authority over component parts will never of themselves produce great economies. Brooms will sweep clean when new, but before long dust accumulates in the old crevices. Unless a constant incentive urges us forward, not only do we fail to progress, we fall back.

The writer is not one of those who believes that authority placed in the hands of one set of men will necessarily produce better results than when in the hands of another set. It seems far more important that a clear definition of the results expected be set down, and that a reasonably accurate system of comparison of efficiencies be developed. The results will then soon prove who are the men most capable of wielding authority.

The subjects covered in the following pages have been, for the most part, largely discussed in recent months. But the writer regrets to state that no great advance has been made towards the solution of the problems involved, although conditions have been improved. By presenting the subject matter at a slightly different angle, and by the introduction of a new element—a record of profit and loss—it is hoped that a well-worn theme may have a certain new interest for the reader.

Some of the steps recommended in this essay are already in effect, as, for example, the division of yard expenses into "Military" and "Industrial." But the writer has deemed it well to go over the ground, as there are many who are opposed to such division. It is also noted that a new system of estimating for the annual appropriations has been put into effect. The writer has not seen this system, and his remarks refer therefore to the methods followed for the current appropriations.

GENERAL REMARKS ON ECONOMY.

There is probably no one who will not admit that economy is a good and desirable thing. In the abstract it is acknowledged to be essential in any undertaking in which effort is measured in terms of dollars and cents. In practice, however, it is not always so easy to get complete agreement as to the desirability of economy. In any given venture there are usually a certain number who maintain that attempts to economize in this particular instance will tend to jeopardize results. Whenever the project is a governmental one the tendency to eliminate economical considerations is apt to be marked, and this is especially so in the case of military affairs. The reason of this is that military expenditures are not usually to be measured by results attained, it being felt that a striving after economy may tend to paralyze, in some degree, the efficiency of the military system. Thus, from a purely military standpoint, it often appears that the introduction of too many economical methods in the industrial work leading up to military purposes serves but to retard the attainment of those purposes to the fullest extent. In other words, too much economy results in a "penny wise, pound foolish" policy.

This view is arrived at owing to a confusion as to what really is meant by economy. While, in a narrow sense, the saving of so many dollars and cents in a given series of operations may be called economy, it is of course no actual economy in the broader sense, if the final results to which the series of operations leads are impaired by such savings. Every one knows this; nevertheless, in ordinary discussions this distinction is frequently overlooked.

In the naval world, industrial operations are carried on for the purpose of preparing and maintaining ships for war. There are definite objects to be attained—so many ships to be built, so many ships and outfits to be repaired, so many technical devices to be installed, etc. As long as these objects are attained fully and on time, it is not, to the military mind ordinarily, a matter of exceeding moment whether the most economical methods have been used in their attainment, or not. Of course, all admit that it would be well if these things could be done more cheaply, and that it is a duty owed to the government to be as careful as possible in the expenditure of its funds. On the grounds of patriotism and honesty all would like to see avoidable losses eliminated.

It is thought, however, that it has not occurred to the service generally that industrial waste (meaning less economical methods than those possible) means a direct loss in military efficiency. That this is so may be shown in the following way:

The navy has grown tremendously since the Spanish War. The money appropriated annually by Congress for the navy has been:

NAVAL APPROPRIATIONS FROM MARCH 3, 1901, TO JUNE 24, 1910.

March 3, 1901	$ 78,101,791.00
July 1, 1902	78,856,363.13
March 3, 1903	81,876,791.43
April 27, 1904	97,505,140.94
March 3, 1905	100,336,679.94
June 29, 1906	102,091,670.27
March 2, 1907	98,958,507.50
May 3, 1908	122,663,885.47
March 3, 1909	136,935,199.05
June 24, 1910	128,958,704.76

From an inspection of this table it is seen that our naval expansion has been very rapid in the last decade. During this period the demand on the part of the country at large for an increased navy was so great that Congress appropriated money for that purpose in increasing amounts each year. The cry for economy has gone forth, however, and it is a reasonable expectation that for the next ten years our annual appropriations will hardly exceed on the average those of the last two years. That is to say, it has now come to the point where the main question is not, "How many vessels and armaments is it wise to add to the fleet each year," but "How can we best expend the appropriations available," since it is evident that our increase and maintenance will be limited strictly to the funds Congress and the people are willing to expend for that purpose.

If, in a conflict five years from now, we are able to place in line of battle one vessel which, as the result of economy in industrial methods, amounting to two millions of dollars per year, we are able to obtain in addition to those we would procure under our ordinary methods, it is evident that economy has directly aided military efficiency, instead of retarding it. This example, while crude, is no exaggeration. It is possible to save fully two million dollars per year, by proper methods of administration, accounting and accountability. And since Congress, and the people at large, will probably permit the expenditure each year of at least as much

is now being expended, the saving will accrue directly to the navy, and thus increase its efficiency.

The above argument is not advanced as new or original with the writer. It is pretty generally recognized as being true by those who have given this subject much thought. It is merely cited here as the basis upon which the balance of this article rests.

It must be perfectly evident, therefore, that the study of economy in naval expenditures is by no means a theoretical subject, but a living, practical issue, calling for the best thought and most earnest effort. The conservation of our resources—naval appropriations—is perhaps the most important military problem now before those engaged in proper preparation for war. Of the total expenditures each year for the naval service, about one-half is made through the various navy yards where industrial work is carried on. The other half consists of purchases of new ships and equipment, pay and subsistence of personnel, etc. It is not the purpose of this article to discuss expenditures under the last mentioned section. The half expended at the navy yards and stations alone will be treated, as it is here that the larger economies are believed to be possible.

THE DIFFICULTIES IN THE WAY OF ECONOMY.

It is believed that the necessity for economizing is apparent to all. It is recognized on every side that too much money is expended for the results obtained. Yet the many difficulties surrounding the case have led most people who have carefully considered the subject to conclude that a large part of the waste is unavoidable. They all see clearly that many elements are present in governmental industrial work which do not have to be contended with in ordinary commercial life. Such are: (1) the military necessity of maintaining shops and laborers to meet sporadic demands of the fleet, such shops and laborers being often not fully employed, (2) the political influences affecting government industrial work, causing yards and stations to be maintained which are really unnecessary, (3) the eight-hour law, which has the effect of increasing the rate per hour paid, (4) the granting of leave and holiday, and the payment of disability claims, (5) the absence of the incentive found in the commercial necessity of producing profits, (6) the alleged impossibility of comparing costs at various yards, owing to the varying conditions

It is thought. … …ages paid, to say nothing of com- generally th… …sts. (7) the complicated appropria- than th… …ing for its object the limiting of expendi- Th… …xpress stipulations concerning the objects for …y may be spent, has actually become so involved …ner as to be useless for such purpose, while, on the …it throws a large volume of unnecessary work into the …accounting records; such are the main difficulties confronting those who would, if they could, efficiently administer the funds of the naval establishment.

It is the hope of the writer that he may be able to show how some, if not all of the obstacles mentioned may be overcome; and that by degrees a system may be set up which not only will permit the more economical operation of government plants, but which will point the way to methods producing results at least equal in efficiency to a majority of the commercial plants.

Looking at this problem in a broad way, it would seem that conditions exist which should warrant the final development of a thoroughgoing economical system. The navy possesses a number of independent industrial concerns, which, judging from the history of industrial development in the United States, are capable of being welded into one vast corporation, under one general management, in which economies can be introduced which would not be possible if the plants were run separately. We have every reason to believe in the efficiency of this method of doing business. Furthermore, we are in the favorable position of a group of financiers who undertake such a consolidation of plants unrestricted as the available capital to use in putting their plans into effect. It is not a question with us of recognizing the necessity of reforms but not being able to go ahead with them on account of lack of funds, a condition often met in the commercial world. We are not under the inexorable necessity of paying dividends and interest on capital continuously, or going into the hands of a receiver. Any well-defined plan which promises economy in the long run can be put into operation at once, even though the results may not be expected to manifest themselves for a year or more.

If we can but once rid ourselves of the idea that the task is practically hopeless (an idea more common than is generally admitted), it is quite possible to make rapid strides toward the goal

of efficiency and economy in industrial work. The government is able to employ the best talent available for the purpose. All that is needed is for the problem to be definitely set forth and scientifically attacked.

After all is said and done, it will probably be admitted that the real, underlying reason for extravagance in government work is due to the lack of incentive toward economy found in the commercial necessity of showing profits under competition. If that, or an equally good incentive can be furnished, the problem is a long way toward being solved.

Now, just what is this incentive in commercial life which leads to the refinement of processes, the reorganizations of business and the vast combinations of capital for scientific and economical production? Is it the desire to make money, to pile up fortunes, on the part of certain capitalists? While that is the result which is most apparent to the eye of the public, I do not think it is the real underlying reason for the achievements in industrial work which so astonish and charm the imagination.

It is rather the desire implanted in the breasts of some men to achieve results, to do good work, to use their science and education to make two blades of grass grow where but one grew before. Men, absorbed in the delights of scientific and engineering achievements, think very little of the cash returns coming to them individually. And even the industrial managers, the men who solve the problems leading to organization and commercial efficiency, themselves obtain but a small part of the financial reward. True, these men are all well paid, and that fact undoubtedly influences their actions. But it is the desire to achieve, to better the performances of those who preceded them, that furnishes the real incentive for their efforts. Even the capitalists themselves, those men sufficiently astute to reap the results of others' industry, are often enough actuated mainly by the same motives—to excel others.

This leads to the conclusion that cash returns are not absolutely necessary for the proper development of industrial work. Does the present efficient management of the Panama Canal construction depend upon the profits being made by the engineers in charge?

The incentive for commercial efficiency is the desire to excel. This same incentive can be utilized in our navy yard plants. Only,

in order to obtain fair competition, the conditions must be such that those competing are cognizant of all the rules and details concerned. And since the competition is to be not only among our own yards, but with commercial plants also, we must be governed by the same rules and conditions governing them, so far as may be practicable.

It is the function of a well-developed accounting system to show clearly and accurately the results of efficient work, to indicate the errors that need correction, and to draw attention to the differences in methods instituted in the various plants, so that the best elements of each may be adopted for all. Such an accounting system should permit of no expenditures being made which in any way affect the plant, without registering accurately and clearly the effect which such expenditures have upon the plant's production. In other words, the product of a plant, when stated in terms of value, must include all the elements of effort, measured in dollars and cents, which have gone to make up that value.

In the government service the cost of a manufactured or repaired article should mean the expenditure which has been necessary to obtain that article or make that repair, being comparable with the expenditure necessary to purchase the article or have the work done by private plants. Anyone who thinks of the "cost" of a government manufactured or repaired article immediately compares such cost in his own mind with what he thinks would be the cost if the work had been done outside. It is psychologically impossible to speak of "cost" without making some such mental comparison, no matter how unconsciously it may be done. Therefore, to say that government "costs" cannot be considered in the same light as commercial "costs" is merely a contradiction in terms. If we wish to substitute for "cost" a "near cost" that is, cost with certain elements eliminated, it will be necessary to use some other word or phrase to express our meaning. Otherwise it must be apparent that we will be continually deceiving ourselves and others, since long habit has made it impossible to prevent the mental comparison to which reference has been made. Of course we could always bear in mind that our costs are different from commercial costs. At least, we could theoretically. But practically we soon leave off the habit of this mental adjustment, and commence comparing in our minds our "near costs" with commercial "costs." Furthermore, it is simply impossible to

make others, outside the government service, remember that we mean "near cost" every time we say "cost" in connection with government work.

It will be well to analyze here just what is meant by commercial cost. In the case of a private plant manufacturing articles or making repairs, costs are commonly ascertained in three stages. Assuming that the plant is divided into several departments, or shops, as most well organized plants are, the article manufactured or repaired has charged to it the labor expended directly on it, the material used, and the "overhead" or "indirect" expenses of the departments or shops in which it has been handled. The summation of these charges give what is commonly called the (1) "factory cost." But in order to produce the articles or make the repairs, the expenses of the managing and office force must be considered, as well as all other incidental expenses not chargeable through the shops. By the addition of these elements we get the (2) "production cost," that is, what it actually cost the private plant to produce the articles. Next to be considered are the expenses of marketing the articles, or obtaining orders for repairs, as well as the profit to the plant, so that we finally come to the (3) "selling cost." The last is really a misnomer from the point of view of the plant, but is quite correct from the point of view of the consumer. In government work we have (1) factory cost and (2) production cost, but not (3) selling cost. That is, our (2) production cost is really our ultimate cost, since we carry the process no further. Or, to put it another way, the third element is zero. Therefore, in comparing government costs with commercial costs, it is quite clear that it is our (2) production costs, which are to be compared with commercial (3) selling costs. Thus, in using the term "commercial cost" it is to be understood that the selling cost to us as consumers is meant. All elements of expenditure made by us to produce articles should then be included in our "costs," just as all elements included in the selling price are included by private firms before we obtain the articles from them.

Having thus clearly fixed in our minds the fact that the results of our productive effort, stated in commercial terms, must include all those elements which are commercially considered as parts of productive effort, and which are in fact necessary towards the realization of the results of production, we next come

to the problem of providing a method by which a measure of efficiency may be obtained in government industrial plants, in the absence of the usual commercial profit.

The plan to be proposed depends upon the fact being granted that the incentive for commercial efficiency is, as the writer has attempted to show, the desire to excel, rather than the actual pecuniary gain immediately accruing to those who make the efforts towards such efficiency. It should be fully understood, however, that this does not mean that pecuniary reward has no weight in the matter. The distinction which it is desired to make here is this: Economic conditions are brought about by the desire to excel, to better the record of someone else. The reward for *having excelled,* is, in commercial life, usually a pecuniary one. It could, just as well, be "honor and distinction," were "honor and distinction" prized as much as money. Frequently the reward usually does consist of the former, rather than the latter. In governmental work, and specifically, in the navy, the reward must usually consist of honor and distinction, with pecuniary benefit to the individual eliminated.

Inasmuch as it is commonly granted that the desire to excel produces beneficial results in such things as target practice and steaming competitions, one may be warranted in believing that it will also serve as an adequate stimulus in the matter of industrial efficiency, provided the contest can be conducted in such manner as to guarantee fair competition. As a matter of fact, it is believed that the contest for supremacy in industrial efficiency can be made along fairer lines than in the cases mentioned, if the facts are gone into thoroughly, because the measure of efficiency will be that tested by long years of commercial practice, whereas in target practice and steaming contests the field is new, and the weights given to the various elements are necessarily experimental.

THE MEASURE OF EFFICIENCY.

The "Profit and Loss" account measures the efficiency of a commercial plant. The distribution of earnings in the form of dividends, etc., marks the point where governmental plants must cease to step side by side with the commercial plants. Up to that point, however, the progress of the two can be compared stage by stage, and though differences will be found to exist, they will

not be of such character, nor so great in amount as to prevent fair comparison. Let us then adopt a " Profit and Loss " account in our naval industrial work, cast as nearly as possible along the lines of the same account in commercial practice. The benefit will be twofold. First, comparison with commercial plants will be practicable (and impracticable otherwise), and second, a fair standard of comparison among our own navy yards will be supplied.

The above is the writer's view of what should be done. Just how it may be done will be set forth in sufficient detail to prove, it is hoped, that it can be done. The description of the " Profit and Loss " account to be clear must follow the discussion of the steps leading up to it, and will therefore be placed later on in this essay.

THE MILITARY POST AND THE INDUSTRIAL PLANT.

A navy yard has two separate and distinct functions, (1) that of a military post, and (2) that of an industrial plant. Expenditures made on account of a navy yard may be for the military post, for the industrial plant, or partly for one and partly for the other. It is essential that all expenditures should be classified and divided between these two objects, before any attempt is made to ascertain the costs of production of the industrial section.

The military post covers that function of the yard which might still continue to exist were no industrial repair or manufacturing work carried on. It is possible to conceive of a yard in which ships would come for the purpose of receiving and discharging stores, transferring officers and men, carrying on drills, etc., and sometimes going into reserve, or out of commission. All repair work would be done by private contract, as occasion demanded. This yard would be a strictly military post, analogous to an army post in practically all respects.

All of the above things are done at our existing yards, and in addition an industrial plant is kept operating for the purpose of making repairs and manufacturing articles required by the ships, instead of reliance being placed on private contractors. It may be objected that the whole yard is really military in its function, since it is purely for military reasons that repair and manufacturing work are done in them at all. That is to say, were it not for the military necessity of having plants ready and available at all

times and particularly in time of war, to make repairs or provide articles needed immediately (and for which it would be unwise to depend upon the resources of private plants possibly unable to accept the work), there would be no need for governmental navy yard industrial plants at all. Except for the military reasons, all work of the nature indicated could well be done in private plants.

The reply to this argument is that while our navy yard shops are maintained for military reasons, they are nevertheless industrial plants which military policy requires us to keep up. Their functions as industrial plants are clear and distinct. The very fact that the work they do could be dône by private plants goes to prove this assertion; for, we have only to segregate those expenditures made by us in order to do this work which might be done by private plants, and we have the "industrial expenditures" clearly defined. Furthermore, it is only consonant with good business administration for us to keep an exact record of what the cost is to the government of the military policy which requires us to maintain these industrial plants, to be compared with another policy, the cost of having the same work done elsewhere. And if in the course of time we can show that the policy we adhere to for military reasons costs the government no more than the other policy, we shall have quieted all opposition to the methods we have adopted for military reasons. That time is far distant, but it will arrive.

If any who read this are of the opinion that the cost of naval industrial work is so intimately involved with military expenditures that there can be no real comparison with commercial work, it is pointed out to them that the adoption of such a view renders it hopeless to attempt to achieve any real economies in our plants, since no basis of comparison could ever be used which would not be nullified by the intangible military element. It is, therefore, worth while to adopt the contrary view, and give it at least a trial.

The military expenses of a navy yard include the maintenance of buildings, grounds, sanitary arrangements, walks, fences, piers, sea walls, craft and vehicles, etc., which are used for military purposes and in general all those expenses which the military part of the yard necessitate. There are some expenditures which are made partly for the industrial and partly for the military section of the yard. All of those should be divided according to the benefit accruing to each section. When any expenditure is to be

made it should be subjected to the following test: "Does it in any way benefit or assist the production at the yard?" If the answer is "Yes" the expenditure should be classed as industrial. If the answer is "No," the expenditure should be classed as military. If the expenditure is clearly for the benefit of both military and industrial plant it should be charged proportionately to both. The writer would not be warranted in going further into the details of this division of expenditures here. It can be stated, however, that the details have been worked out, and that they are practicable.

The question of economy in the industrial portion of the yard will now be taken up, but first let us recall a conversation which took place during a hearing before the House Naval Committee last winter. The quotation is as follows:

MR. PADGETT.—Now, then, how would it do to make the whole establishment in the navy yard industrial along the same line that the industrial yards of the country are, and let them bid for their work at the department in the same way that they would bid or that bids would be submitted by the private concerns?

ADMIRAL CAPPS.—I think I fully understand your proposition, Mr. Padgett, and it is rather fascinating as a proposition, but it has many practical difficulties.

The chief constructor then illustrated the difficulties of specifying in detail the exact nature of contemplated work, in order to secure bids. These difficulties are indeed great. The writer believes, however, that they can be overcome, but only after a thorough revision of the navy yard financial system. More will be said about this question under the heading of estimates. The "fascinating" proposition was so exactly in accord with the writer's own view that he cannot forbear quoting it. While it may not be practicable or desirable to have our yards actually compete for business with private plants, it certainly should be possible to compare costs accurately with those of commercial concerns. To do this we must make the yards industrial "along the same line that the industrial yards of the country are."

COMPARISON OF EXPENSES IN PRIVATE AND GOVERNMENT INDUSTRIAL PLANTS.

It is frequently stated that government plants work under a serious disadvantage, as compared with private concerns, in that the former have expenses which the latter do not have to meet.

The examples most frequently quoted are (1) the eight-hour law, (2) payments for leave, holiday and disability, and (3) higher rates of wages. These are the most serious obstacles to successful competition with commercial output. Let us examine them in detail and see what effect they have on our navy yard costs, and then take up the other side of the question, expenses of private plants which our plants do not have to contend with.

(1) The eight-hour law.

The tendency to reduce the hours of labor has been very marked during the last two centuries. Against seemingly insurmountable obstacles the number of hours per day which the laboring class must work in order to obtain subsistence has been gradually reduced. Legislation has many times been employed towards this end, and signs are not wanting that it will be frequently used successfully in that direction in the future. The normal period for factory workers is now about ten hours per day. It is urged by those in favor of reduction of this time that the output of a laborer working eight hours per day will equal that of the same class of man working ten hours, the argument being that ten hours is too long for efficient work throughout the day. Whatever may be the merits of this argument, let us ignore it, and assume that of two men receiving the same wages, the one working ten hours does 25% more work than the one working eight hours. Then for work done in a government plant the labor cost will be 25% greater than the same work done in a private plant, assuming that our eight-hour man receives the same daily wages as the ten-hour man. The extra expense due to the eight-hour law is then, under the above assumption, 20% of the total labor cost. The expenditure for labor at the New York Navy Yard during the fiscal year 1909 was $3,913,594.53 (exclusive of pay for leave, holidays and disability). Twenty per cent of this amount is $782,718.91, which represents the cost of the eight-hour law at the Navy Yard, New York. During the same year the expenditures at this yard were, for leave, $140,143.18, for holidays, $136,721.03, and for disability, $9,652.48.

The rates of wages at our navy yards are theoretically the same as in the surrounding industrial plants. As a matter of fact they are nearly always slightly higher, since each trade receives the highest rates paid in surrounding plants. If it is considered that in any given private plant, some trade will receive a somewhat

greater rate of pay than the same trade in other plants, but that in no plant do all the trades receive this increase, it will be seen that where a navy yard pays the high rates of each plant, and the low rates of none, its general average of rates must be higher than the general average of any one private plant. At a guess, assume that of the total wages paid, 5% covers this increase in rates, and we get $195,679.73 as this extra cost. We have then

(1) Eight-hour law	$ 782,718.91
(2) Leave, holiday and disability	286,516.69
(3) Higher rates of wages	195,679.73
Total	$1,164,915.33

This is a pretty heavy bill for one navy yard to pay annually on account of the items specified, even though it is our largest yard. Each of the others pays much less. But let us now consider certain items with which private plants must be charged before their product can be delivered to us as consumers, and which are not charged to our plants. These are (1) interest, (2) taxes, (3) legal expenses, (4) advertising, (5) selling expenses, (6) dividends on stock, and many others. For purposes of comparison we will confine ourselves to but one of these, the last mentioned, dividends on stock.

The industrial plant of the Navy Yard, New York, is worth roughly, $20,000,000.00. Such a plant, privately owned, would be bonded for about that amount.

In addition to the bonds, however, stock to a value at least equal to the bonds (very probably more) would be issued, representing the good will, or going value of the concern. Annual dividends must be declared on this stock, and if the plant is at all successful, these dividends would be at least 6%.

As has been stated, this amount must be covered by the selling costs, and would have to be paid by us as consumers (that is $1,200,000.00). Here is an item which of itself is greater than the extra labor costs of the New York Yard which have been itemized. This one item has been picked out as having a peculiar interest. It represents the amount accruing to the shareholders, that is, the partners in the enterprise. The writer suggests therefore that in our naval accounting the amounts paid for short time (eight hours instead of ten), for leave, holiday and disability, and the slightly higher rates of wages, be considered in the same light as

dividends, the workmen themselves being the shareholders in the enterprise. This subject will be further touched upon under the "Profit and Loss" account, and "The Workman's Point of View."

The writer is fully aware that the comparison made above is far from exact. A private plant with an investment of $20,000,000.00, would probably produce a much greater output than does the New York Navy Yard, in order to pay an annual dividend of $1,200,000.00 in addition to the interest on its bonds. But, on the other hand, the New York Yard, under different and improved methods of financial and administrative management, could equal the output of the private plant, without appreciably increasing the extra labor expenses which have been cited.

It is believed that the foregoing will serve to show that many of the claims advanced in connection with high government costs, will, if analyzed, find offsets in private costs, and that there is still "a fair field and no favor." As a matter of fact, it will be found, after thorough examination, that the ordinary expenses of a navy yard plant, after providing for the extra labor costs as indicated above, will be closely similar to those of the usual industrial plant of the same caliber. That is, assuming of course that the purely military expenses have been properly segregated, a problem of no great difficulty when carefully studied. But before going further it will be necessary to consider the capitalization of navy yards.

CAPITALIZATION OF NAVY YARDS.

In order to arrive at any just estimate of the value of work, the value of the tools which have been used must be considered. It is perfectly apparent that work which is the result of manual labor only has far less value than work which employs the same amount of labor, but which also utilizes expensive machinery and plant facilities of all kinds. The amount of capital invested in an enterprise is evidently, therefore, an essential element towards arriving at a fair appreciation of the cost involved in turning out work.

A navy yard being both military and industrial, the capital investment will fall into these same divisions. A certain number of buildings, grounds and utilities of various kinds have been placed in the yard on account of its military functions, while

others are there only for industrial reasons. A large proportion of the capital investment is used for both military and industrial purposes, as for example, the grounds, paving, sewerage, wiring, etc. which serve all parts of the yard. In such cases an estimated division must be made, assigning to the military and industrial capital accounts such portions of the common properties as seem most equitable, taking into consideration all the purposes and uses to which all such properties are put. In some instances a fairly simple calculation will determine the proper division, as for example, the sewerage system, whose cost would be divided, other things being equal, according to the values of military and industrial buildings served. Other properties, such as the sea wall, must be divided on a purely estimated basis, and considerable care should be given to this division. The expenses of maintaining each division of property should thereafter be classed as "military" or "industrial" as has already been explained.

It has been the usual practice of the Navy Department to take a decennial inventory of its navy yard properties, but the division indicated above has not been undertaken, as the inventories so made were not intended to be further utilized in any general accounting scheme. Therefore, such inventories, or valuations, have not played a very important part in naval accounting, although they have served to give a general idea of the value of the navy yards.

In the great railroad rate controversy now before the country, the proposed physical valuation of the roads plays an important part. The government experts contend that before rates can be passed upon with any degree of justice, it is essential that the capital invested be known, in order that proper allowances may be made for interest on such capital, as well as for the necessary annual depreciation of machinery and equipment, etc. "Capital invested" does not mean here the values of stocks and bonds issued, as that is easily determined, but the actual present value of the properties.

Involved in this question is that of the value of the "good-will" of the companies, and other considerations, which lead the railroads to cling to the theory that the proper rates are "all that the traffic will bear." With the last mentioned element we are not concerned, but the question of physical valuation is one that interests us, since we also should determine, by appraisal, what the book values of our navy yard properties are.

In a private plant the value and kind of the property determines the expenditures which must be made for (1) interest on capital invested, (2) taxes, (3) depreciation, (4) insurance. To what extent does the value of our properties affect our expenditures?

We pay no interest on capital invested. The funds advanced by the government for the construction of our plants are regarded as expenditures simply, and not as capital in any sense. It has occurred to the writer that it would be equitable to charge against our plants the average rate of interest which the government pays on its outstanding bonds. But this would be a purely fictitious charge, and if actually carried out, would simply result in certain repayments to the general treasury of funds advanced, that is, a reduction of appropriations. Therefore, as matters now stand, no possible advantage would accrue by the charging of interest against our plants, since no such expenditure is actually made.

This opens up the rather interesting question as to whether it would not be advisable for the government to issue bonds for all new construction work such as the building of navy yard plants, instead of paying such amounts directly from yearly revenues. That this would be no new departure is shown by the fact that the Panama Canal is being partly constructed through a bond issue. In the writer's opinion it would be far better if the entire cost of the canal were covered by bond issues, instead of partly, as at present. When the canal is completed, and the problem of the proper toll rates is to be solved, this question of interest charges on bonds will assume considerable importance, and it would be much better if the whole construction cost were then found to be on a recognized sound financial basis.

Our navy yards could very well be bonded, and thus placed in a business like and satisfactory situation. However, there is not space here to go into a detailed discussion of this subject. They are not bonded, and, therefore, there are no interest charges.

As regards taxes, the situation is much the same. Private plants do not pay taxes to the national government, although they do pay State and city taxes. Were it otherwise, it would be proper to charge against our navy yard plants the value of taxes which would be assessed by the national government against a private plant in the same place, since the navy yard plant may be assumed to supplant a private organization of the same capacity. Conditions being as they are, however, it is necessary to ignore taxes also.

Both interest and taxes might be charged on a theoretical basis, but many difficulties would be involved, and further, it is believed that only actual expenses should be included in our calculations. We do not wish to compare what we might or should expend, but only what we do expend, with the expenditures of commercial plants.

When we come to the subject of depreciation, however, we are no longer on really debatable ground. There is no question that a government plant depreciates, and consequently suffers loss leading to expenditures for that reason. This subject is so important that a separate heading will be given to it. In this connection it is interesting to note that again a parallel can be drawn to the railroads of the country, which were at first opposed to the plan of charging an annual depreciation against their properties. They have, however, become reconciled to the rulings of the Interstate Commerce Commission, requiring this to be done.

DEPRECIATION IN NAVAL PLANTS.

Any plant doing industrial work necessarily suffers wear and tear, which must be offest by renewing and replacing parts. Also, machinery gradually gets out of date, and even though it may be still in good condition structurally, it has nevertheless lost value through obsolescence, and must from time to time be replaced by newer and better types. Thus, in order to maintain a plant at its full value, constant expenditures for new parts must be made, this being entirely independent of increase in size and value of plant made in order to increase the plant's capacity. It is apparent that such expenditures for renewals and replacements are in reality part of the plant's running expenses, and that it is necessary to provide for them, and to consider them when ascertaining the cost of the work produced by the plant. If a shoemaker, in estimating the prices at which he could afford to sell shoes, should overlook the cost of keeping up his supply of tools, he would soon find that he was running behind. The principle is the same in any industrial plant.

While the science of accounting was yet young, it was customary to add to the year's expenses the costs of new tools and equipment, when calculating the costs of production. It was found, however, that this direct method was unsatisfactory in its results, on account of the fact that the expenditures for renewals

and replacements during any one year failed to bear a proper relation to the actual wear and tear, and obsolescence during that year. Thus a new plant would, during its first few years, have very few renewals and replacements to make and the costs of production would accordingly be figured to be much less than in succeeding years, when large expenditures had to be made for new machinery and equipment. As a result, costs fluctuated to an unreasonable degree, being too low in the early years, and too high in later years. To meet this difficulty the method of calculating depreciation was devised. This is nothing more or less than the estimated loss by wear and tear, and obsolescence, per year. For example, it has been ascertained that machine tools last, on the average, from 16 to 20 years, after which they must be renewed. Therefore the depreciation rate on machine tools is placed at 5 or 6 per cent per year. This is on the assumption that the loss in value per year is the same throughout the available life of the tool, which is not strictly true, but sufficiently close, as we are only dealing in averages anyway. By fixing a depreciation rate of say 5 per cent on all machine tools in a plant, it is not intended to convey the idea that any one given tool will last just 20 years and should then be discarded. Many machine tools last much longer than this and still render good service. On the other hand, it is often necessary to replace a tool only 8 or 10 years old. But taking all the tools together, over a term of years, experience has shown that the average life is from 16 to 20 years, in plants of the character of our naval establishments. Other kinds of equipment have different rates of depreciation. There are good engineering and accounting precedents for each.

By the use of depreciation, then, it was found that the average loss in value could be charged up each year, and in fact, each month. By the opening of suitable accounts in which the estimated depreciation charged appeared on one side of the ledger, and the renewals and replacements actually made appeared on the other, a check could be obtained over a term of years, and the estimated depreciation could be adjusted accordingly. In commercial practice "Depreciation Reserve Funds" are established, to which are turned over each year the amounts deducted from income on account of estimated depreciation. The costs of renewals and replacements are than defrayed from these "Depreciation Reserve Funds" as fast as new equipment is needed. In

the long run it is expected that the amounts placed each year in the "Depreciation Reserve Fund" will approximately provide for *all* renewals and replacements of parts of the plant, necessary to maintain it at full value. New plant and equipment which are extensions to the original plant and so increase its value are not paid for from this fund, but require additional capital for their installation. This is one of the difficult problems in industrial accounting calling for considerable skill in its solution. That is, whether a new machine, or other equipment, supplants an old one, or whether it is a direct addition to plant. Common sense and judgment are necessary for a correct decision in each case.

So much for depreciation as handled commercially. The question now is "What necessity, if any, is there for including this element in naval industrial accounts?" The arguments against it are (1) the navy not being a commercial organization, must not endeavor to follow too closely commercial accounting practices. (2) The subject is a theoretical one, not a practical one. (3) The inclusion of depreciation in naval costs would make them excessively high. (4) Congress has not provided for depreciation funds, nor intended that current appropriations should bear such a charge.

There are doubtless other reasons which would be advanced by opponents of the depreciation theory. But in answering these four it is probable that the other objections will be met.

In regard to (1) the writer has already explained his views, and has expressed the belief that we should not use the word "cost" unless we mean "cost." Depreciation of plant is a highly important element of cost. Where depreciation accounts are not maintained in private plants (and it is getting rarer and rarer to find such plants) all replacements and renewals of plant are charged directly as part of the running expenses, and so prorated to the cost of production. In the long run this brings the same results, but is inaccurate for any special period. There is no excuse for naval plants to ignore both depreciation, and its counterpart, "renewals and replacements," and at the same time to refer to the "costs" of our work! What advantage do we reap in deceiving ourselves in the matter?

But, aside from the fact that we record erroneous costs if we fail to take depreciation into account, is there any positive advantage to be gained by including that element in our cost ac-

counts? That is to say, is it a practical problem or merely a theoretical nicety?

As a matter of fact, it is not only a common sense, practical thing to absorb depreciation into our costs; it is also a direct advantage in the interests of economy. Further, it is practically impossible to reap any lasting results from the application of cost accounting to naval industrial work, if the element of depreciation be eliminated. The explanation of this is as follows:

Our navy yards are now being placed on a standard basis of accounts, especial care having been given to the arrangement and subdivision of the "expense" accounts. By "expense" accounts are meant the records of those expenditures which are classed as "overhead" or "indirect." Assume that this standardization has been satisfactorily completed, and all yards are running on a similar basis. Depreciation is not, however, considered. The first effect of this standardization is to produce a certain economy, since each yard, being in competition (more or less complete and fair) with the others, and also anxious to better its own past performances, trims expenses as much as possible in order to reduce the percentage of "indirect charges." It soon becomes apparent, however, that the yards which have the newest and best machinery, best buildings and plant equipment generally, have a decided advantage over the more poorly equipped yards. Machinery, buildings and equipment being new and of good quality, fewer minor repairs and adjustments are necessary. The yards having poor equipment find that all sorts of minor repairs are required, thus swelling their expense accounts. Furthermore, the better equipment does better work, thus reducing costs all along the line. Nor is this all. The poorly equipped yards find it necessary to spend larger sums in major repairs and renewals. Although these expenditures do not affect the expense account nor the recorded costs of production, they eat heavily into the allotments of funds.

In order to reduce the apparent "indirect charges," all yards now find it advantageous to consider, as far as possible, most necessary repairs as being "renewals and replacements" instead of "shop" or "general expense." It is obvious that such practice vitiates the worth of the expense account records. Yet it is practically impossible to prevent it, in the absence of the deprecia-

tion element. With this element properly accounted for, the difficulty disappears, as will be shown later.

The most grievous result of this improper accounting (ignoring depreciation), is as follows: As has been said, poorly equipped plants are at a disadvantage in the comparison of expense accounts as now made up. The natural result is each plant is eager to purchase and install new equipment. There is no check whatever on the procuring of new machines, etc., save that found in the question of available funds.

If the funds can be secured from the Department, each plant is inclined to procure newer and better tools. Frequently special appropriations are passed by Congress for that purpose. Usually the new tools are put to good use. But the need for such new tools is merely a matter of opinion. No one is able to state whether it would be better business for the government to continue using the old tools a little longer. The converse of this is equally true. When new tools are actually needed, it is still a matter of opinion whether or not they should be procured. Thus large wastes are produced, on the one hand by the unnecessary purchasing of new and discarding of old equipment, and on the other hand (though much less frequently) by using old equipment at a loss which might be averted by the installation of better tools.

THE PRACTICAL BENEFITS OF INCLUDING DEPRECIATION IN THE ACCOUNTING SYSTEM.

By including the element of depreciation in our cost accounts we would obviate many of the difficulties just mentioned. The question of whether or not new machinery should be installed would be settled in a more scientific and practical manner than at present. Assume, for the moment, that Congress has authorized the establishment of depreciation reserve funds at each yard. Each year a sum is placed to the credit of this fund, being calculated by multiplying the value of each class of plant and equipment by the depreciation rate of that class. The summation of these results giving the total estimated depreciation for the year. If the plant is a "going concern," neither old nor new, the amount so placed in the depreciation fund is a fair measure of the amount which ought to be spent in renewals and replacements during the same period, in order to maintain the plant at full

value. Of course this is not the exact amount to be spent, taking any one year alone. But over a number of years, carrying balances forward, and assuming that the depreciation rates were carefully fixed, a very just estimate of the amounts properly to be spent for renewals and replacements is obtained.

Again, take the case of two plants, one with generous and the other with indifferent equipment. We have seen that where depreciation is not taken account of, the well-equipped plant has an immense advantage in calculating its expense account. But the inclusion of the element of depreciation changes this situation considerably. The plant with the expensive machinery, and with a great deal of it, also has a heavy depreciation charged up to it. The plant with lower valued machinery, and not much of it, has much less depreciation to contend with. Conditions immediately become more fair, and comparisons of cost of work begin to mean something. The plant with the poorer equipment is not induced to rush into the purchasing of new machinery until it has ascertained whether the lower cost of operation by reason of new equipment is, or is not, offset by the additional amount of depreciation to be charged against its product. This is certainly the most fair and sensible view to take of the question of purchasing new equipment. That is—is it cheaper in the long run? Other considerations have to be taken into account, of course, such as increased speed of production of new equipment, desirable for military reasons, though costing more. But bearing in mind our definition of true economy, we arrive at the same result.

Again, the tendency, which has been mentioned, to charge against the "renewal and replacement" account expenditures properly to be classed as "expense" items, is practically overcome. All expenditures for "renewals and replacements" must be made from the "Depreciation Reserve Fund." Close scrutiny must always be given to expenditures from that fund. Any unwarranted expenditures, such as items properly belonging in the "expense" account would merely cramp the fund for its legitimate purposes, and be decidedly unwise, from the viewpoint of the plant itself. Thus would the temptation to reduce expenses in that way be forestalled.

Trusting that the advantages of including depreciation in our accounting system have been made clear, let us examine further some of the alleged disadvantages.

WOULD THE INCLUSION OF DEPRECIATION IN NAVAL COSTS MAKE THEM EXCESSIVELY HIGH?

Those with whom the writer has discussed this question of depreciation in cost accounts have usually brought one argument to bear against the proposition which has been extremely difficult to refute. It is this. Our navy yards contain shops, machinery and equipment designed to turn out an amount of work in a given period, which may be called the normal output. Conditions rarely permit this amount of work being done for any continuous time. Consequently, the plants are usually running much below normal in regard to output. Were the depreciation charges of the plant, designed for a large output, entirely located to the cost of production during long periods of low output the resultant cost accounts would be practically worthless, since the depreciation element in such costs would be excessively high. Thus all hoped for advantages to be gained through comparison with commercial costs would fail to be realized. How can this difficulty be obviated? First, let us examine the situation as found in private plants. Here, we find that the depreciation element in costs is based upon the normal output of the plant, and fluctuates but little with variation of output. Should it happen that the plant is compelled to run for a long period below normal output, it would be impossible for it to raise costs of individual articles sufficiently to absorb the entire plant depreciation. It would be unable to market its product at all, if that were done—assuming that our typical plant is running in competition with others. What the plant actually does is to charge the unabsorbed depreciation up against "Profit and Loss." This question is discussed more fully under "Manufacturing in Navy Yards." The point to be observed here is that only the normal depreciation should be charged to current production. If the naval plant is running with low output, part of the depreciation should not be absorbed in the cost of production, but otherwise accounted for. The exact method by which this unabsorbed depreciation can be handled will be described under "Profit and Loss" account.

To adopt this system the following calculations would be necessary which will be described as though already in effect. The depreciation charged to any work in a given plant depends upon the shop or shops in which the work is done. Different shops of the same plant of course have differing depreciation rates, de-

pending upon the quality and quantity of machinery and other equipment in use. The value of all machinery, equipment and buildings for a given shop having been ascertained, and depreciation rates fixed, the depreciation of that shop for a month will be a certain fixed amount. The normal output of that shop is decided upon. To measure this output we use the " productive labor " which is the basis upon which our expense proratings are made. It must be definitely decided just what is the normal productive labor in each shop. This must not be the maximum productive labor possible, but a fair estimate of the amount which would be thus expended were the shop running under a comfortably full complement—not overcrowded. The total monthly depreciation chargeable to a shop, divided by the normal productive labor, then gives the percentage of depreciation to be thereafter added to each dollar of productive labor in that shop. It matters not whether the shop runs full or partially full, the depreciation charge for a given job is now the same. The depreciation not charged to cost of work (in case the shop is running below normal) is carried to the " Profit and Loss " account exactly as in the case of a well-organized private plant. How it is handled there will be described under that heading.

The above described system will prevent any undue charges from the introduction of depreciation in naval cost accounting. It is of course merely approximate in its working. It may, perhaps, be claimed, that unreliable results will be obtained, due to this approximation; that is to say, the fixing of the normal output of a shop might be so erroneous as to prevent true data being furnished in subsequent operations. For example, if the normal productive labor were fixed at too high a figure, the shop would probably run continuously with an output seemingly below normal, and therefore the depreciation which rightly should be distributed entirely to the cost of work (the shop being actually in a normal condition, though erroneously rated below normal) would only be partly so distributed, thus giving erroneous costs. The answer to this argument will be found in the fact that the temptation on the part of those interested in the shop to rate its output too high will not be so great as might at first be supposed. If that is done, it will merely result in a continuous loss in the " Profit and Loss " account being charged to that shop, on ac-

count of unabsorbed depreciation. This will be more fully understood after the description of that account has been read.

There remains to be considered the fact that Congress has not authorized "Depreciation Reserve Funds" and that such authorization is necessary before such funds can be established.

Although the ordinary commercial method is to handle the question of depreciation through the establishments of these funds, it is quite possible, in the naval service, to treat the problem differently, by opening "Depreciation Reserve Accounts." It should be understood that in accounting parlance, a "fund" is a sum of money set aside for certain purposes, while an "account" is merely a record of a series of transactions. The depreciation problem, if merely handled through reserve "accounts" will not call for the setting aside of sums of money, and therefore will not require Congressional authority.

Just how the "Depreciation Reserve Account" can be installed and operated it is not thought necessary to describe, as it is not essential for the purposes of this essay.. The method has, however, been worked out in detail.

It is to be earnestly hoped that Congress will direct the establishment of proper depreciation funds at the several yards, in order that the system may be modeled after commercial methods, and thus handled without the numerous difficulties which will result from the necessity of departing therefrom.

INSURANCE

While the government does not insure its property, it does suffer losses by fire, just as a commercial organization would which did not insure. Insurance, in the long run, merely has the effect of spreading fire losses evenly over a long period, instead of paying for such losses as they occur.

The probability of fire among the different classes of property has been carefully worked out, on which basis the insurance companies make their rates. Such rates include, of course, all the necessary expenses and profit of maintaining insurance companies. Since the probability of loss by fire for each class of property is known, it would be a good idea for the navy to establish a fire insurance fund of its own, in the same manner as that urged for a depreciation fund. To the cost of maintaining all kinds of property should be added an item for insurance, at rates less than the

ordinary commercial rates for the same classes of property, since no company charges are included. The appropriations paying the cost of maintaining the property, either through the cost of work accounts, or directly in the case of military maintenance, would also pay this insurance item. In that way the fund would be established. As buildings burn at our various yards, the cost of replacement would then come from the insurance fund. Where a larger and better building was put in place of the old one, only the value of the old building could be taken from the insurance fund. The difference must be separately appropriated for as it would be an addition to capital value.

The arguments in favor of this are exactly the same as for the establishment of a depreciation fund. Fire loss is after all nothing but depreciation through fire.

In the absence of Congressional authority for the establishment of such a fund, an " Insurance Reserve Account " can be set up and made to answer the purpose, just as in the case of " Depreciation Reserve Account."

PROPOSED LEGISLATION.

The necessity for including depreciation and insurance (which is but a form of depreciation in our case) in our accounting system has been set forth. In order to accomplish this the following legislation is proposed:

From and after July 1, 1911, the accounts of all naval industrial plants shall include charges for depreciation and internal insurance against loss by fire, in accordance with accepted methods of accounting. Reserve funds shall be established for this purpose, to which the annual estimated depreciation and insurance of naval property shall be added and from which actual replacements and renewals of property shall be deducted. And for the establishment of such reserve funds, the " Naval Supply Fund " amounting to $2,700,000.00 is hereby made available.

The writer can only state that some such legislation is essential for proper accounting in the naval service, and he suggests reference to any firm of expert accountants for corroboration.

ESTIMATING AT NAVY YARDS.

Before work is undertaken at a navy yard, an estimate of its probable cost is made. If the work is of importance, such estimate must be approved by the Bureau under whose control the funds about to be expended lie. In general, all estimates are so

passed upon, since the jobs of smaller importance are really parts of larger jobs, or the work contemplated is of a routine character, for which a general approval has at sometime been given.

The preparation of estimates is not given that attention which from its importance it really deserves. This is mainly because the work being mostly of a repair nature, it is difficult to estimate very accurately what it will cost. It is very seldom that any given job is precisely similar to a preceeding job. Furthermore, as the work proceeds, unexpected difficulties are apt to crop up, the cost of overcoming which has not been included in the estimate. A private plant doing repair work has exactly the same difficulties to contend with. In its case, however, the estimate made in advance is of greater importance, since it forms the basis on which the bids for the work were made. If the work actually costs more than was anticipated, a loss to the plant must be charged up. If it costs less, a greater profit accrues. Thus a powerful stimulus is furnished towards accurate estimating, which is not at present to be found in government practice.

It is believed that if a similar stimulus existed for navy yards estimating, there would be very marked improvement shown. And an improvement in the accuracy of estimates would be of tremendous advantages to the various Bureaus who have to pass upon the question of authorizing proposed work. At present, authority is sometimes given for work to be done at a certain proposed cost. That estimate of cost is perhaps the determining factor in the decision as to whether the work should or should not be undertaken. The work is carried to completion, and the resultant cost is found to be far in excess of the estimate. Had the estimate been more accurate the work would probably never have been authorized, and some other more important work would have been undertaken, which now lack of funds prohibits.

The estimate given by a yard for doing a piece of work is equivalent to the bid of a private firm. The writer would like to see a system adopted by which the navy yard's plant is held to its estimate, so that the cost to the Bureau concerned is exactly that estimated (that is, the bids). Such would not be possible under our present appropriation system. But at least it is quite feasible to record the differences between estimates and performances, carrying them to a "Profit and Loss" account (see description of that account).

It is of course not to be expected that estimates should closely approximate the actual costs. But they should at least be reasonably close. Otherwise, there would be practically no use in preparing estimates at all. There is no doubt that if it were known that a careful record was to be maintained, showing the ability of the plant to work within its estimates, and that the records of the various plants would be compared in this respect, great improvement would follow. The " Profit and Loss " account would fulfil this function excellently.

It may perhaps be claimed that no good result would be obtained, since the natural tendency would be to make estimates as high as possible, in order to be sure of living within them, but it should be remembered that in that case authority would often be refused for the undertaking of many jobs which excessive estimates would render out of the question. Also, some classes of work at the various yards would be sufficiently similar to warrant comparison of estimates. Further, in many cases the cost of doing such work in private plants would be known. So that, on the whole, it is not thought that there would be much danger from " loading " of estimates.

There is one class of estimates for which the method just described is peculiarly suitable; viz., the estimates of probable costs of repairs, made by officers when surveying articles of equipage turned in from ships. The line of reasoning usually followed in such cases is this. A damaged article, which in the opinion of the surveying officer can be profitably repaired for future use, is known to be worth, when new, a certain amount. It is considered that after the necessary repairs have been made, the article will then have a value which depends upon its probable degree of fitness. For example, if the repairs will make the article as good as new, the final value after being repaired should be the same as the original value. If the repairs are expected to render the article useful, but not as good as new, the final value should be less than the original value. The surveying officer, after deciding what the repairs would cost (obtaining estimates from the shop or shops where the work is to be done), appraises the article at a price, which, with the estimated cost of repairs added, will bring it up to what he considers will be the correct value after the repairs have been made.

The repairs are made upon the articles. If the cost of such

repairs agrees with the estimate, the article is turned into store at a proper invoice value. In most cases, however, the actual cost of repairs differs widely from the estimated cost. Frequently the difference is so greatly in excess as to cause an absurd valuation of the article, and steps are then necessary to readjust such valuation. In the majority of cases the result is not happy, and repaired articles are apt to be invoiced at prices which do not at all represent their value.

In the place of this system it is recommended that surveying officers fix the present appraised value of the article, and at the same time the final invoice value which it shall have after repairs. The difference will, of course, represent the estimated cost of repairs. No matter what the repairs actually cost, the article should be invoiced at the value fixed by the surveying officer. But the difference between the estimated cost and the actual cost should be carried to the " Profit and Loss " account.

Such a method would prevent improper invoice values of repaired articles, and would immensely simplify what is at present often a difficult and vexatious problem in accounting. At the same time excess costs of repairs would be sharply drawn to the attention of those interested in the expenditure of funds under the various appropriations.

This question of estimating is a big one, and the writer does not intend here to go into the problems concerned with the manner of making estimates. There are many who believe that it is practically impossible to make any great improvement in the accuracy with which the probable cost of naval repair work can be foretold, placing their opinions on the ground that no two jobs are sufficiently alike to warrant the expectation that past performances can be duplicated in future work. They also point to the fact that it is the unexpected element which so frequently renders final cost disproportionate to the estimate, as for example, when a boiler, whose condition must be judged from the outside only, is opened up for repairs and found to be in a much worse state than was anticipated.

The writer believes that a close study of this subject will prove that while practically all repairs differ when considered *in toto*, yet there is some uniformity in the various operations which go to make up various classes of completed work, and that these operations can be to a certain extent classified. Estimates based

upon a series of operations, each of which has a probable cost fixed by experience, should then be more accurate than merely considering the proposed job as a whole. Unexpected elements which present themselves during the course of the work could be segregated and reported as causing the difference between estimated and actual cost. If in the judgment of those authorizing the work this unexpected element is one which could not reasonably have been foreseen, an increase in the estimated amount might be permitted, just as in dealing with a private contractor we sometimes allow an increase in the price to be paid on reasonable grounds. Otherwise the difference must be recorded as a loss in the " Profit and Loss " account.

MANUFACTURING IN NAVY YARDS.

It is usually considered inadvisable to carry the business of manufacturing articles in navy yards any further than is absolutely necessary for the needs of the moment.

With the exception of certain articles, such as cordage, chain and anchors, boats and their outfits, flags, and in general, articles which are either not obtainable commercially in just the form or quality wanted for naval service, or for which custom has established the practice of navy yard production, the Department discourages manufacturing. The reasons for this are (1) the danger of producing large quantities of articles through the temptation of keeping men employed, thus overstocking heavily; (2) the high cost of government manufactured articles, due to the fact that navy plants are not usually equipped to turn out articles as cheaply as private firms, which specialize in them; (3) the plants are primarily repair plants, and manufacturing might interfere with this more legitimate object; (4) the opposition towards competing unnecessarily with private plants. For these reasons, it is sometimes urged that navy yard plants be prohibited entirely from manufacturing articles. It undoubtedly is true that the first two reasons are the more important, and that if they were rendered non-existent, the others could be disposed of. Considering the first two reasons only then, it is desirable to take up this subject from a different, and it is believed, new point of view.

In a properly organized government plant, the manufacture of articles for stock will be controlled absolutely by the average demand for those articles for use. While it may be admitted that

in a navy yard, run on indefinite lines, without centralization of authority, and without adequate conception of the evil results following unnecessary manufacturing, overstocking will occur; yet, in a well-administered plant, in which the final effect of errors of this kind are well understood, it is certain that no such danger will exist. It might as well be claimed that excess stock is bound to accumulate through purchasing in the open market. Yet it is well known that in recent years improved methods of administration and accounting have reduced this danger to a minimum. As a matter of fact, overstocking has occurred in the past from both manufacturing and purchasing. It has been practically cured in the latter case, and it can be in the former. It is granted at once that under present navy yard methods, manufacturing is a danger. But having improved the general conduct of business in navy yards to the required point, the danger disappears, and manufacturing may be carried on without fear of overstocking, provided it is for other reasons desirable.

We have seen that a navy yard plant, owing to the varying demands made upon it for repair work, fluctuates in activity over a wide range. The equipment must be sufficient to meet maximum demands. In slack periods there is consequently a constant expense going on, due to the upkeep of plant, care of buildings and machinery, and depreciation. This expense is almost, if not quite as heavy as when the plant is fully operated. Furthermore, although there is really not sufficient work for them, many men are kept on the rolls, pending the time when their services will again be urgently needed. Many employees are, of course, discharged at this time. But others must necessarily be retained, as it would be impossible to get hold of them or others equal to them immediately when the rush of work comes. This may be classed as a military necessity, since the yard must be ready to do repair work on demand. The condition, however, is also found in commercial plants. Hence, such plants are constantly hunting for work, not only for the profit to be obtained, but to keep their men and plants employed, until better conditions occur. Thus, in slack times work is often taken and the product sold at prices which show a book loss. But the loss is less than would have occurred had no work of the kind been done. Depreciation and general expense had to go on anyway. Deduct those items from the cost of production of the work referred to, and a profit is shown on the transaction.

In the same way, our navy yard plants and employees, when work is slack, should be utilized if possible. Assume, for purposes of argument, that a list of articles used in the naval service can be prepared, of such a nature that the same plant equipment and workmen employed in repairing ships can also be employed in the manufacture of those articles, when there is but little reparing to be done.

These articles must, for their production, require the usual classes of labor common in navy yards. They must be such that it is economical to carry a fair stock, that is, the demand for them in the service must be constant. They must also be obtainable commercially when needed, since occasions might demand the entire cessation of their manufacture in the yards during long continued repair work. It would then be necessary to procure these articles in the open market.

Having, after careful study and investigation of the facilities for manufacture in every plant, assigned to each a list of articles to be manufactured, of the characteristics described above, we would then be able to offset in some degree the fluctuations of work of a repair nature only. This plan would only be used as an adjunct to that recently put into force by the Department, by which ships go to a yard for general overhauling in rotation, thus distributing the work more evenly than has hitherto been the case. Considering repair work only, there will always be periods of full and slack times in navy yards, as it is impossible to lay down any exact routine for work of this nature, many repairs being necessitated by casualties, attention to which cannot be delayed. The manufacturing program as outlined can be made to partially, if not completely fill in the gaps, if carefully designed and adhered to. It is important that in assigning articles to be manufactured at the several yards, a division be made, so that each yard may manufacture only certain things, instead of all yards manufacturing all the articles on the list. Or to put this in another way, any articles on the list should be manufactured at one yard only. That yard, by frequent repetitions of the process, will be able to bring the cost of production of the article to a much lower point than would be possible if the necessary supply were produced at all yards. This is in reference to stock articles, and does not apply to special appliances which are only manufactured occasionally.

For example, the joiner shop at a certain yard can be profitably employed, when not engaged on repair work for ships, in manufacturing chests of the various kinds used in the naval service. It is found that the entire stock necessary for the navy can be manufactured in that one shop, working in what would otherwise be slack times. Do not allow that shop to manufacture a lot of other stock articles, but confine it to chests. It is evident that better and cheaper chests will be produced than if they were made at each yard, as occasion demanded. Other joiner shops in other yards will have their own specialties. Shipment of such articles from one yard to another is comparatively inexpensive, and the storehouses will be able to maintain stock easily in that way, and at the same time to control the quantity of articles produced; it being understood that each lot manufactured must be to fill a requisition for stock.

It is not pretended that this is a simple problem, or that a great deal can be accomplished in a short time. It is believed to be worthy of serious study, however, and there is no doubt that application of such a system will gradually produce invaluable results.

It is, of course, true that attention is now paid to the desirability of utilizing our shop resources, when not otherwise employed, in manufacturing articles for our own use. But the study given to it is by no means adequate to its importance. This is largely owing to the fact, to which attention has been called, that the policy of the Department is to discourage the growth of manufacturing. Such policy has been correct, inasmuch as there was no well-defined plan is existence as a safeguard to the danger of indiscriminate and excessive manufacturing. But with the adoption of such a plan, great possibilities for economies are introduced. The alert manager, finding from the monthly statements that in certain shops constant loss is going on from lack of employment, begins to search the list of articles needed in the naval service, to discover those in the manufacture of which he thinks his shops might well be employed. He selects certain ones for which his equipment is suited. He knows he cannot turn out these articles at their usual invoice price, but he also knows, and is able to prove to the Bureau interested in the furnishing of such articles, that the loss involved in manufacturing them is less than the loss going on by reason of unemployed shops. Having made good this point,

and having received authority to manufacture the articles, which must be invoiced to store at their usual market price (see " Prices of Manufactured Articles "), it now becomes a struggle to reduce the loss shown by the difference between manufacturing cost and invoice value. Here we have a definite object to be attained, and there can be no doubt that gradually the cost of production will be reduced to near the actual value.

This is but an example of what may be achieved. But, it will be asserted, such a system will be liable to abuse. Granted, but since we know it is liable to abuse, and since the whole policy proposed depends upon a system of accounts under which abuses are bound to be recorded, we can safely, under a watchful eye, permit this danger to exist.

In the ordinary repair work falling to the lot of our navy yards, there is usually not much chance to plan ahead for economies by the distribution of the work in such manner as will best suit the shops. Everything must be done in a rush, and it is not possible to know very far in advance how much work is coming, nor when. Manufacturing offers the only field for satisfactory and accurate planning. It is more on a par with ordinary commercial work, and should be extremely useful in showing to what degree of excellence our shops are from time to time arriving. This aside from the actual saving to be effected by the judicious management of manufacturing work.

PRICES OF MANUFACTURED ARTICLES.

Articles manufactured in navy yards usually carry a higher invoice value than the same articles when purchased. Where this is not so at present, it will undoubtedly be the case if all the cost elements are included in such invoice value.

If such articles are issued to the service, bearing high navy yard prices, a discrepancy results in the records of costs of repairs and costs of commission of ship. Especially is this true when articles of the same kind are purchased and issued at lower prices. Under the modern competitive system, this is likely to work serious injustice. Articles manufactured in navy yards should therefore bear prices in accordance with the real values, no matter what it has actually cost to manufacture them. If the same kinds of articles are both purchased and manufactured, the latter should be valued at the market price of the former, so that both may be issued to the service at the same price.

This is practically equivalent to the condition to be met by a private firm which has manufactured articles at a cost higher than the market value. Such a firm must sell its product at the market price, no matter what it has cost to manufacture.

To comply with this condition, all articles manufactured at navy yards for stock should have their invoice prices determined beforehand.

Such prices should agree with those of similar commercial articles, unless there is reason in certain instances to believe that the quality of navy manufactured articles is somewhat better than that of the commercial grade. Rope manufactured at Boston is a case in point. In such instances prices might be placed a little higher than the ruling market price.

There will then have to be accounted for the difference between invoice price and actual cost of manufacture. This difference should be carried to the "Profit and Loss" account (see description of that account).

A study of the amounts carried from the cost sheet of a given article, to the "Profit and Loss" account, will indicate whether or not that article is being manufactured economically. Full control of the cost of production will thus be retained, while excessive expenditures in that direction, if made, will not work injustice to the records of those who use the articles.

THE "PROFIT AND LOSS" ACCOUNT.

In a commercial enterprise the final proof of success is found in the balance shown in the "Profit and Loss" account. The results of all endeavors towards efficiency are measured here. All errors of omission or commission make themselves felt in this statement, each item of which can be analyzed in such a way as to furnish valuable information in connection with plant economy. Without such an account a private industry would be indeed helpless.

Naval plants are not run for the purpose of making profits, to be distributed in dividends, or otherwise. Or, to express the same idea in another way, the profits of private plants, which are expected to vary from large amounts in some cases to small sums in other, should, in a naval plant, be zero. Aside from this difference, such a plant has so much in common with ordinary in-

dustrial concerns that one is led to the conclusion that the absence of so vital an element as a final record of success—or non-success—must necessarily be as fatal to its efficiency as it would be to that of its commercial rivals.

What, then, can be instituted to take the place of this very essential element of commercial business? Is it not practicable to devise some record which will indicate, in our accounts, the failure or success of individual departments to achieve economies? It should surely be possible to ascertain and record the results obtained by the introduction of new machinery, or the improvements in methods, in about the same way that private plants do.

To the writer the difference in conditions between governmental and private industrial plants is more apparent than real. In fact, it is believed that such an account can be set up, which, although not exactly similar to the commercial account of the same name, will yet be so nearly like it as to be, for all practical purposes, the same.

The profits and losses of a naval plant may be described as the differences between the actual costs of certain kinds of work or expenses and the anticipated costs. The clearest case is that of the difference between the cost to manufacture an article, and the price which must be set upon it after manufacture in order to conform to the ruling invoice value. This has been dwelt upon under the heading of "Manufacture in Navy Yards." If the plan of invoicing all manufactured articles at what is considered their value, be adopted, then, if it actually costs less than this value to produce the article, the difference may clearly be set down as a profit to the plant. If it costs more to manufacture than such invoice value, the difference should just as clearly be recorded as a loss.

By entering in our "Profit and Loss" account the figures thus pertaining to each article or class of articles manufactured, we would have a most valuable record of our plant's ability to successfully manufacture the articles concerned. At the same time attention would be immediately directed to those articles showing excessive loss, and either more economical means of production would have to be devised, or the manufacture of such articles discontinued.

The next class of entries to be considered are those arising from the differences between estimated costs of repairs and final

costs, also between estimated and final costs of manufacturing special articles not having fixed invoice value. The two classes practically form one problem. Here the differences are not so absolute in their nature. The errors may be entirely due to mistakes in estimating. Nevertheless it would be of great value to get such errors so located as to indicate whether they are usually all one way or the other. The classification of these errors or differences by departments and shops would also be of great assistance in determining where indifferent estimating or excess costs arose. As stated under the head of " estimating " it is believed that much improvement is possible in that particular, and the bringing out into relief of the " high spots " would necessarily be the first step in the right direction. Certainly comparisons could be instituted between various yards as to their ability to work within their estimates for all classes of work, and the worst offenders could speedily be taught to profit by the methods of their more skilled brethren, which is after all one of the prime advantages of our industrial combination of different yards.

The question of depreciation in shops running below normal output was discussed under the head of " Depreciation in Naval Plants." The " Profit and Loss " account, by showing such a condition in succeeding monthly statements would lay stress upon it, and render it imperative to adopt curative methods either by securing additional work, or, if thought best, reducing the equipment of the shop to a proper basis. This question was also touched upon in the section relating to manufacturing.

The " shop expense " of the various shops, covering the items of expenditure necessary to maintain them in running condition (except replacements and renewals for which sufficient depreciation is allowed), is in naval practice usually fixed upon a basis of a percentage of the direct labor employed. At the end of each month this percentage of direct labor in any given shop will, of course, either be less than or exceed the actual running expenses of the shop. The differences should be carried to the " Profit and Loss " account for each shop concerned.

To recapitulate, the following should be some of the entries made in this account: (1) The under absorbed depreciation, if any, as described under that heading; (2) the under or over absorbed " shop " and " general " expense; (3) the difference

between invoice value and actual manufacturing cost of articles manufactured; (4) the difference between invoice value and actual cost of articles repaired; (5) the difference between the estimated cost of work on ships and the actual cost; (6) the difference between the estimated cost of other classes of work and actual cost.

The entries made in this account under items (1) and (2) would indicate whether or not a shop were running continuously below normal output. Should this be found to be the case, it would then be evident that better oversight is needed in procuring work for that shop; or that its normal output has been rated too high, and should be reduced, in order that depreciation charges may be more fully absorbed; or that the shop has more facilities than is needed, and its equipment should be reduced.

Under item (3) the entries would indicate whether or not articles were being manufactured at a loss. If at a loss, the details of cost should be investigated, in order to ascertain whether or not the manufacture of the articles in question should be continued, taking into consideration the point made under "Manufacturing at Navy Yards" that it is often true economy to produce temporarily at a loss, rather than have the plant lie idle.

Under items (4), (5) and (6) would be shown the ability of the plant to work within its estimates. It would be of immense value, from the viewpoint of the Bureaus of the Department, to have each plant struggling to keep within its estimates, in order to prevent the showing up of errors, either of estimating or carrying out of work; and "Profit and Loss" account would fulfil this function admirably.

There would be many other items to be carried to this account, not possible to enumerate here. When finally made up each month, this account would show, in as much detail as may be desired, the final efficiency for that month. In no other way is it possible to justly criticize the work of a plant. No matter how efficiently the managers of a plant may think they have conducted it, unless they have some means of taking into account all the elements of expenditure, and to set off all losses suffered against all gains made, they cannot really know whether the net results have been good or bad. Mere opinions in regard to

specific improvements inaugurated cannot be accepted until the whole story is known, and the details fully set forth. A standard to measure by is essential and the proposed " Profit and Loss " account will fulfil the requirement.

It is not assumed that such an account will be absolutely accurate, especially when first set up. But there is no question that, after experience has modified its essential elements, it will prove invaluable as an aid to intelligent dissection of the months' work.

This account, taken in conjunction with the plant " balance sheet " will tell the tale of plant efficiency (or non-efficiency) unerringly to those educated to its importance.

Having struck our balance at the end of the month in the " Profit and Loss " account, it must needs be disposed of. Under our present appropriation system this can best be done by prorating the balance among the leading annual appropriations in accordance with the amount of direct labor applied for each Bureau concerned. If it is a loss, each of the appropriations referred to must contribute for the month more than its work cost. If a gain, such appropriations will pay less than the calculated value of its work.

If the one general appropriation system, as described herein, should be adopted, the loss or gain would affect its expenditures only, thus simplifying this particular problem. Specific appropriations should always be charged exactly what the work costs.

The above is not intended as more than a general description of the account and its workings. Being new, the details would necessarily develop after the plan was undertaken.

As already stated, the writer regards such an account as the key to any successful system of navy yard accounting. Without it, mere opinion only must be depended on to advance ideas of efficiency, and no proofs can be adduced to support such opinions which will bear close analysis.

The ideal condition of navy yard economy would be arrived at when the total net balance in the " Profit and Loss " account, in favor of the plant, exactly equalled the amount which was paid during the same period to the laboring force in the shape of leave, holiday and disability pay. This would be equivalent to an exact distribution of earnings in dividends, regarding the workmen as the only stockholders.

THE GENERAL ACCOUNTS OF THE PLANT.

Having properly "Capitalized" our plants, the next step is to open and maintain books of record and accounts which will at all times show our financial standing. At present we do not really keep books at our navy yards, in the accepted sense. We merely record data in order to make reports to the Navy Department. This is true of Boston, New York, etc., where the new systems have been installed, as well as at the other yards, since the general books, although opened, have not been actually utilized, and the reports still continue.

What is needed most of all is decentralization from the Navy Department. All the elaborate reports now transmitted to the Bureaus should be discontinued, and each yard should be required to maintain a thoroughly up-to-date bookkeeping system of its own. Balance sheets, and certain detailed reports when required, would give the Bureaus all the needed information to keep in touch with the yard work. These balance sheets, combined into one grand statement at the end of the fiscal year would give the figures necessary to be transmitted to Congress. A vast waste of clerical labor would thus be avoided.

Under the heading of "Administrative Methods" the writer has indicated his views as to the duties of the inspectors. If those views were carried out, the great mass of figures transmitted monthly to the Bureaus would be unnecessary. The inspectors, being on the spot, could correct all those mistakes the occurrence of which the Bureaus now claim renders the detailed reports essential.

All exceptional points would, of course, be reported to the Bureaus, such as excessive costs of certain jobs, etc. To these the Bureaus could give that attention which is hardly possible when a mass of data, most of which needs no remark, has to be considered.

Besides all this, by decentralizing, and placing the responsibility for keeping affairs straight on the yards themselves, the officers at the yards would necessarily become more familiar with the effect of various kinds of expenditures which now once reported are soon forgotten. Thus a sort of watchful care on the part of those at the yard would be instituted, not now possible while the main responsibility rests on the Bureaus.

APPROPRIATIONS.

Under the heading of "The Difficulties in the Way of Economy" reference was made to the complicated appropriation system under which we obtain the funds necessary for carrying on our industrial work. Various recommendations have been made in the past for the simplification of this system, which, had they been adopted, would have improved matters a great deal. Nevertheless no plans which the writer has seen have in his opinion quite furnished a satisfactory solution of the difficult problem involved. It is not entirely a simplification or condensation of appropriations which is wanted, but rather a change in method quite outside these desirable attributes, to be utilized, however, in connection with them.

Our present appropriation system is, of course, the outgrowth of years. Old customs and ancient methods are mirrored in their verbiage, and there might perhaps be some sentimental and historical reasons to be urged in favor of perpetuating their quaint and picturesque turns of expression. But as a matter of practical administration it is unwise to continue this time-worn custom.

Our appropriations, so far as they affect our industrial operations, are (1) specific appropriations, and (2) annual appropriations. The specific appropriations are those granted for some definite purpose such as the amounts allowed for various public works, and the increase of the navy appropriations. The amounts so authorized are usually expendable exactly within the terms of the law, and cause little or no difficulty. The discussion which follows will not relate to them at all, or only to a slight extent.

The leading annual appropriations are those under which the greater part of our industrial work is done. They are "Construction and Repair," "Steam Machinery," "Ordnance and Ordnance Stores," "Equipment of Vessels," "Maintenance Yards and Docks" and "Repairs and Preservation at Navy Yards." Whenever one of the appropriations named is referred to, the fiscal year to which it pertains is appended, since each of these appropriations is available only for the purpose of the year for which it is granted.

All of these annual appropriations (except one), specify in detail some of the purposes which they are intended to cover, and at the same time each has one or more general clauses which enable it to be used for almost any purpose, or at least for any

purpose which common sense would prescribe as properly within the purview of the Bureau which has cognizance over it. Thus "Construction and Repair" has the following: ". . . . general care, increase and protection of the navy in the line of construction and repair." Steam machinery has "For completion, repairing and preservation of machinery and boilers of naval vessels, including cost of new boilers; . . . ."

"Ordnance and Ordnance Stores" has "For providing, producing, preserving and handling ordnance material; . . . ." Then comes "Equipment of Vessels," which, after mentioning several things, has ". . . . and for the purchase of all *other* articles of equipment at home and abroad, and for the payment of labor in equipping vessels and manufacture of equipment articles in the several navy yards." If the word "other" were eliminated, none of the articles need have been mentioned. "Maintenance Yards and Docks" states at once that it is "For general maintenance of yards and docks . . . ." and then proceeds to state what those maintenance charges are. The one exception is "Repairs and Preservations at Navy Yards," which has no explanatory data, and is therefore to be taken at face value.

Until recently, as is well known, there were at each navy yard five working departments, representing five Bureaus of the Navy Department. The appropriations just named were utilized by the Bureaus concerned to carry on the larger part of their activities in the various yards, the Bureau of Yards and Docks having two (last named). It will be readily seen that the general clauses of these appropriations actually cover their intents and the addition of other language, *not prohibitory* in any sense, but merely in further description of the characteristic expenditures to be charged against them, do not in any way limit their functions. That is to say, the words "such as" are always to be understood as preceding the detailed list of objects named. Such has always been the tacit understanding of the Navy Department, although not always directly expressed. In pursuance of this construction, each working department in the navy yards used the funds of the general annual appropriation allotted to it for all necessary purposes, whether specifically mentioned by the appropriation or not, the general clause always being fallen back on when required. This led to a curious arrangement, or understanding, which was never fully analyzed by those concerned. The Department of

Yards and Docks, expending the two appropriations which, by their terms, covered the ordinary maintenance and repair items of the yard, was usually furnished with insufficient funds for that purpose, owing to the fact that the amounts appropriated were too small. Consequently the money of those appropriations was restricted, as far as possible, though not entirely, to the items actually mentioned under "Maintenance Yards and Docks," the general clause not being drawn upon. But there was not even enough money for the items specifically named, taking the entire yard in consideration. Consequently the other appropriations "helped out" to a large extent, in the payment of running expenses, which their general clauses made entirely practicable, the aid of each being confined, however, to its own particular department.

This method worked well enough as long as the five separate departments continued in existence. But when the yards were reorganized, combining these departments into one, and finally into two, trouble was experienced. The several appropriations in many instances provide for the same class of expenditures. As long as the old departmental boundaries existed, each appropriation was drawn upon for expenditures within its own department, and there was not apt to be a question as to which appropriation should meet any general expense capable of being met by all. It was settled by the department in which the expense arose. But with the removal of these departmental boundaries, that convenient method of arranging the matter disappeared. Compromise was resorted to, and the introduction of new cost accounting methods providing for a prorating of expenses among the appropriations, aided towards a partial solution of the problem. This latter element, however, brought new difficulties to be contended with. The aim of a cost accounting system being to ascertain as nearly as practicable the true cost of production, it was, of course, desirable to include in such cost all those expenses commonly classed as "overhead" or "indirect." The two yards and docks appropriations are by their very nature of this overhead character, so far as they pertain to the industrial yard. Here we have a difficulty which renders the obtaining of true costs quite complex. On one hand is an appropriation which provides for the producing of a certain article, the cost of which, properly

calculated, includes a fair proportion of the overhead charges of the establishment producing it. At the same time we have another appropriation which provides for the payment of a part of the overhead charges. If such part of the overhead charges is paid by the second appropriation, the article produced necessarily has its cost only partly charged to the first appropriation, and the second appropriation pays the balance. These two appropriations together pay for an article which one appropriation only was intended to be expended for.

The truth of the matter is that separate appropriations for the upkeep (maintenance and repair) of an industrial plant are confusing and unnecessary. Such expenditures are properly a part of the cost of production chargeable to the appropriations specified by law to bear the costs of production—meaning, by production, repairs to ships, as well as manufacture of articles. Maintenance appropriations are, of course, necessary for the military section of the yard, but they should be confined to that section.

From the foregoing it must be evident that the system of specifying in extreme detail just what a general appropriation is to be used for, and then throwing in one or two clauses which permit the use of the appropriation for any expenditure coming under the purview of the Bureau concerned, has its objections. No actual restriction is placed upon the use of the appropriation, but a lot of useless verbiage is included which sometimes leads to difficulties, as when two or more appropriations specify the same thing, not infrequently the case. Thus "Construction and Repair," "Steam Machinery," and "Equipment of Vessels" all authorize the purchase of machine tools. "Ordnance and Ordnance Stores" does not, yet the last named appropriation has frequently purchased machine tools under its general clause. Since the consolidation of departments in yards it is often an embarrassing question to decide which of these appropriations shall pay for a needed tool.

Perhaps the best example of this wrong system is found in the restrictions placed in each of the leading general annual appropriations relative to employment of clerical and drafting force. Each mentions a limiting amount which may be used for that purpose, the proviso having been first inserted when there were the separate working departments for each appropriation, at

which time the limitations were inserted to prevent the employment of undue clerical and drafting forces in those departments. At present, however, the clerical and drafting forces are distributed without regard to those appropriations, conditions having absolutely changed. The result is that there is no more reason for paying any individual from one appropriation than from another. Consequently the limiting amounts are in effect lumped, a new appointee going to the appropriation which has the most money available for that purpose.

A simple proviso in one appropriation limiting the total amount to be employed in navy yards for clerical and drafting force would be much more business like.

In any event it is clear that appropriations which meet the conditions of a five-department yard will not be suitable for a two-department yard.

In place of these general appropriations the following is recommended, the amount being based on the current appropriations.

REPAIRS AND MAINTENANCE, NAVY, 1911.

Labor, material and incidental expenses necessary for repairing and maintaining naval vessels of all kinds, and for the manufacture or purchase of all supplies and equipage not otherwise specifically provided for, and to offset depreciation of naval industrial plants, twenty-five million dollars.

Then would follow such restrictive legislation as Congress now inserts in the leading annual appropriations. The above appropriation would take the place of—

Ordnance and Ordnance Stores	$ 5,425,000.00
Repairs, Ordnance	30,000.00
Miscellaneous, Ordnance	9,000.00
Equipment of Vessels	3,843,300.00
Contingent Equipment	100,000.00
Construction and Repair	8,979,144.00
Steam Machinery	6,256,000.00
Handling Stores (deducted from Provisions, Navy)	447,556.00
	$25,000,000.00

The estimates on which this appropriation should be based are shown in the following section of this essay.

Separately should come the following appropriation:

MAINTENANCE MILITARY YARDS.

Maintenance, repairs, and preservation of the military portions of navy yards and stations, and all necessary appurtenances, two millions and twenty thousand dollars.

This is made up of

Maintenance Yards and Docks	$1,290,000.00
Contingent Yards and Docks	30,000.00
Repairs and Preservation at Navy Yards	705,000.00
	$2,020,000.00

Let us examine into the effect of this system of appropriating.

In the first place, every expenditure now possible under the separate appropriations of either group would be possible under the consolidated appropriations substituted. Considering the first group only, it will be seen that all the varied language of the separate appropriations (which it is not deemed necessary to quote) does not make the situation any clearer as to what the money is to be used for than does the language of the consolidated appropriations. It is impossible to give an idea of the scope of an appropriation by naming a few more or less insignificant items. The fact that the money is to be used for certain distinct purposes, clearly specified, is all that can be expected or desired.

What disadvantage would there be to the separate Bureaus in having their leading annual appropriations consolidated as shown? It will doubtless be claimed that the Bureaus would be at a loss to determine their authority over the available money, and hence could not proceed securely in the prosecution of their work. The answer to this is that the total amount of such an appropriation would, of course, be based primarily on the estimates submitted by the Bureaus, and that after final action by Congress it would be perfectly plain to just what extent each estimate had been amended, and therefore each Bureau could start the fiscal year with an allotment of the general appropriation based on its *approved* estimates. As the year proceeded, however, it would become apparent (as it always does) that some estimates were over, and some below the actual needs. Adjustments of allotments would then result. The working Bureaus, drawing from a common fund, would be brought in closer touch with each other. Furthermore, all those questions concerning the point as to where charges to one Bureau's appropriation end and those to another

Bureau's appropriation commence would be practically done away with. Inside a turret, for example, work may be going on at present chargeable to "Construction and Repair," "Ordnance," and "Steam Machinery." It becomes a nice point sometimes to locate the charges correctly. If it were merely a question of where allotment was concerned the question would be much simplified. A system of give and take, or a readjustment of allotments, would settle the difficulty.

Each Bureau would still maintain its authority over certain classes of work, just as at present. If necessary, the scope of each Bureau's authority could be made a matter of permanent law, instead of embodying it largely in the annual appropriation acts, as is now done. That would be a much better plan.

Is the one appropriation any looser, that is, more capable of improper use, than the separate ones? Not at all. Quite the contrary would be the case.

It should be especially noted that actual economy would result from the adoption of the plan proposed.

It frequently happens that deficiency appropriations are necessary to assist certain annual appropriations. At the same time other appropriations were close to, but within the mark. Had these appropriations merely been separate heads or estimates of the one grand appropriation, the excess of some would have been compensated for by holding up expenditures under others, and thus no deficiency appropriations would be called for. The writer has a fairly intimate knowledge of the conditions governing the control of naval appropriations, and he feels safe in saying that sometimes amounts are expended because the money is available which would not have been used for the same purposes could the money have been utilized to assist other appropriations. The result has been, however, that extra amounts have had to be called for to assist the exhausted appropriations, while, as stated, the money under the appropriations with a surplus was expended also.

The above argument only pertains to those appropriations which are of the same nature, and capable of being welded into one general appropriation as shown. It applies in no sense to specific appropriations, such as those for public works, increase of the navy, etc. These are properly segregated, being for separate and distinct purposes.

in advantage, the overshadowing one in fact, is that
ıeral appropriation would permit of accurate accounting,
y as regards cost accounts, which the present method
:tremely difficult. In fact, it has prevented the adoption
ess like, true cost accounting system. This has already
ained. To exemplify it further, note the condition
sts every day in navy yard work. Say that repairs to a
ilers are underway, authorized by the Bureau of Steam
ng. Certain hull work is required in connection with
irs. Since such work is chargeable to the construction
appropriation, that Bureau's approval must be obtained
is undertaken. When approved, a separate job order
ɔpened for this "assisting job," as it comes under a
ppropriation to that of the main job. Consequently the
ɔf the work (even as calculated under our present de-
stem) is never found in one place. Usually the cost of
ting jobs" are lost sight of, unless they happen to be
nount.
ıe one common appropriation for such work, the above
: be the case. The job opened for the repair of the
uld be charged with the cost of all the work done in con-
ith it, the hull department and the machinery depart-
ıe yard each doing the necessary work coming under its
n. The total cost would be charged to the Bureau of
ıgineering's allotment, since it is that Bureau which
and supervised the work. It is difficult to convey ac-
he difficulties which now arise from the necessity of
ɛparate each Bureau's appropriation for general work.
to say that fully half the accounting force is occupied
problem.
ɔropriation for the "Maintenance of Military Yards"
special explanation. The main thing is to get it sepa-
ı the industrial appropriations.

ESTIMATES FOR THE GENERAL APPROPRIATION.

imates to be submitted by the Bureaus concerned, on
general appropriation recommended is to be based,
in about the form shown in the following table:

ESTIMATES SUBMITTED.

Title charged.	Bureau of — Ordnance.	Equipment.	Cons. & Rep.	St. Eng.	Total.
D	$641,000	$1,200,000	$5,600,000	$8,700,000	$11,141,000
N	140,000	190,000	125,000	20,000	475,000
O	93,000	50,000	60,000	30,000	233,000
P	60,000	70,000	160,000	55,000	345,000
Leave, etc.	140,000	105,000	435,000	250,000	930,000
V	286,000	285,000	600,000	400,000	1,571,000
B, C, and Y	406,000	2,000,000	2,300,000	1,945,000	10,305,000
	$5,420,000	$3,900,000	$9,280,000	$6,400,000	$25,000,000

D = Repairs to vessels and machinery.
N = Tests and experiments.
O = Stores placed aboard naval militia ships.
P = Repairs to equipage aboard ships.
V = Incidental expenses, including unabsorbed depreciation and other unabsorbed expenses.
B = Equippage issued to ships.
Y = Supplies issued to ships.
C = Miscellaneous expenses of commission of ships.

Here we have each Bureau's estimates separately stated, and then combined into one grand estimate for each item. This supplants the estimates now rendered independently by each Bureau, for its general appropriation.

The item for "Handling Stores" which, as has been shown, is now included in "Provisions Navy" is distributed, in the above table, to the estimates of the Bureaus mentioned.

Included in the estimates under each item are the "Indirect Charges" which should properly form part of the cost of work to be done. A separate estimate of these charges should also be submitted, although no extra appropriation should be made therefor, since they are to be absorbed into the cost of work done under the general and under the specific appropriations. The general appropriation, however, carries an item of a little over $1,500,000—see Title V—to which the *unabsorbed* expenses (this has been explained) should be charged. This item, being largely due to undesirable fluctuations in volume of work, may be expected to decrease each year, as more accurate planning of work is instituted.

The estimated "Indirect Charges" for the industrial yards of the current fiscal year would have been, under this system, similar to the following:

ESTIMATED INDIRECT CHARGES.

Maintenance of:	
Grounds	$ 180,000
Buildings	400,000
Yard Appliances	170,000
Yard Craft	300,000
Dry Docks	100,000
Fire Apparatus	20,000
Telegraph, Telephone, Etc.	60,000
Vehicles and Live Stock	100,000
Power Plant	700,000
Machinery Plant	500,000
Office Force	1,800,000
Water	100,000
Hand Tools	300,000
Handling Stores	500,000
Miscellaneous	1,000,000
Depreciation	1,200,000
Total	$7,430,000

These figures are, of course, very rough, and are merely intended to give a general idea of the method of preparation. Only after one or two years of accurate accounting could they be expected to approximate the facts. Sufficient data does not exist at present to properly prepare these figures.

The above list of expenses would be made up by combining the figures from each industrial yard.

All of the above figures should be submitted to Congress in connection with the proposed general appropriation act. The following year the actual figures, side by side with the estimates previously made, should be laid before the committees, together with such explanations of the differences as may be pertinent. This closely follows the British system of reporting expenditures.

SOME REMARKS CONCERNING ADMINISTRATIVE METHODS.

Concerning the method of administering industrial navy yards, expecially as between the one-department and the two-department systems, this article has very little to do. As elsewhere expressed, the writer's opinion is that this question is of far less importance than is that of providing a thorough and satisfactory system of financial control, based upon logical appropriations, and built up into a business like structure, self-centered and self-con-

tained. An industrial navy yard is made up of units consisting of shops. The grouping of these shops into one, or two divisions is simply a question of administrative expediency, to be settled in accordance with the beliefs of those who have the power to enforce their opinions. Either plan will work, and work well, provided the right men are in charge, and, as before stated, a sound financial policy is in operation. Lacking one or both of these requirements, either plan will fail, ultimately.

The object of this essay being confined almost entirely to the financial end of this problem, little need be introduced regarding the personal element. There are one or two points, however, which must be touched upon.

The main effort of a navy yard plant should, of course, be directed to producing efficient results in all departments, rather than in perfecting one section at the expense of another. Thus entire cohesion and thorough understanding, a pulling together of all parts is necessary. In the present two-department organization there is bound to be a certain tendency for each department to endeavor to excel the other, without much regard to the common good. And this without any real desire to injure or retard the other, but entirely through a lack of coordination. While the commandant is the general manager, so far as directing the work to be undertaken, etc., the business of the two departments is run very nearly independently. This is more true of some yards than of others, but is applicable in some degree to them all. What is wanted, therefore, is a business manager, to coordinate the business affairs of the two departments. This officer should not be concerned with the actual carrying out of work in the shops of either department, but should be occupied solely with such questions as issuing one series of job orders when work is authorized, instead of having them issued in two series, as at present; collecting estimates from the two departments, and combining them into one statement, instead of having separate estimates go to the Department; following the progress of work in the two departments, with a view to preventing one waiting on the other, before being able to go ahead with its own, a situation not infrequently arising in ship repairs. In general this officer's business would be to assist the yard to run smoothly as a whole, and thus increase its efficiency. He would have no duties in connection with the military side of the yard, his function being purely industrial. Such an officer could be a member of either of the three corps

most interested in industrial work, the line, the construction, or the pay corps. It would, perhaps, be valuable to have at one yard a line officer, at another a constructor, and at a third a paymaster, to fill this office. In the course of time results would show which was the most suited to the work. It would be necessary, of course, to adopt a thorough going financial system, along similar lines to those suggested herein, before any useful results could be obtained from such a competition.

The managers of the hull and machinery divisions occupy positions which it is believed should in some respects be more clearly defined. These officers, as stated by the regulations, are not the representatives of any Bureau. Nevertheless the tendency still persists to regard the manager of the hull division as the representative of the Bureau of Construction and Repair, and the manager of the machinery division as that of the Bureau of Steam Engineering. This leads to a pulling apart of the two divisions, which is fatal to efficiency. As has been stated, a business manager would aid in lessening this difficulty. It cannot be fully eradicated, however, until it is realized that the efficiency of the yard, its ability to show a profit rather than a loss, is the main consideration, and that the two divisions should have no direct affiliations with the Bureaus. The Bureaus are, in a sense, the customers of the yard. It is their money which is being spent, and their ships which are being repaired and equipped. The relations between the Bureaus and the yard representatives should be somewhat similar to those of the Bureaus and representatives of private plants. They could never be the same, or near the same. But it would be advantageous, for purely business reasons, to simulate these conditions as far as possible. The managers themselves, therefore, representing, as they do, the plant, and not the Bureaus, should have very little voice in the character and extent of contemplated repairs to ships to be undertaken at their yards. These officers, being human, are very likely to be influenced, when recommending repairs, by the fact that certain shops need work, etc. Further, all are familiar with the complaints of officers aboard ship that the yard officers are too much inclined to do things their own way, without giving due weight to the opinions and wishes of those who have to operate the ships and apparatus installed aboard them. While such complaints are often without warrant, it happens that they are sometimes well founded. But if it were understood that the kind of work, and its extent, was

to be settled by the captains and officers on one hand, and the Bureau representatives (the inspectors, of whom more later on) on the other, the managers being called in for advice whenever necessary, but having no voice in the decision, it is believed that things would work much more smoothly. Then, the contemplated work having been decided upon, let the managers take hold and put it through, according to the specifications given them. In other words, do exactly as would be done were the ship being repaired at a private plant. The officers of the ship and the inspectors following the work closely.

The inspectors, should, it is believed, be in very close touch with the Bureaus. In fact, each Bureau should have an inspector (or inspectors) to act as eyes and ears for it at the yard. Many details which are now sent for consideration of the Bureaus could just as well be settled by their representatives, the inspectors, on the spot. All elaborate and detailed reports of costs, etc., would then be unnecessary. In fact, the allotments of funds should be made through the inspectors, who would then be in a position, and would be required, to watch expenditures carefully. The accounting officer, by keeping the inspectors posted as regards the condition of allotments, would enable them to watch the interests of their Bureau carefully, much better than is now done with the Bureaus depending upon monthly reports for that purpose. The above presupposes the disassociation of the managers themselves from the Bureaus, which is regarded as absolutely essential, since a man cannot serve two masters, that is, the yard and the Bureaus.

The advantages of the method outlined above are too numerous to mention. The writer believes that the placing of the inspectors on the basis of directly representing the Bureaus and eliminating the managers from that position would do more than anything else towards the practical realization of efficiency, after the correct financial methods have been installed.

THE WORKMAN'S POINT OF VIEW.

A discussion of navy yard conditions which overlooks the point of view of the mechanics and laborers, whose work forms the most important element of the yard's efficiency, would be incomplete. And yet this is a phase of the subject which usually receives very little attention from those interested in navy yard economy.

In industrial affairs there is always going on a quiet but intense

struggle between the forces of labor and the forces of capital invested in industry. The normal tendency is to keep the wages of labor just above the bare cost of subsistence, the laborer struggling to raise them as much above such cost as possible, and capital striving to depress them a near as may be to equality with it.

Without going into a discussion of the reasons for this condition of affairs, it may be pointed out that the situation of the navy yard employee is usually a shade better than that of his fellow in private plants, since the efforts of capital, as represented by the government, are here very much relaxed. In fact it is possible to treat the whole subject of the relations between employer and employed in a much more humanitarian way, in the government industrial service, than economic conditions permit in the outside commercial struggle.

The most serious factor which confronts the navy yard employee is the reduction of numbers made every now and then, on account of lack of work. This renders his position insecure, and makes it necessary for him to take protective measures. These usually consist in (1) the use of political influence, if possible, to retain his position when work is slack; (2) the use of the same influence to provide work for the yard, in order that his employment may continue; and (3) the extension of each job as long as possible, for the same reason. The first and third methods result in direct economic loss to the yard. The second, while not injuring the yard, is bad for the government itself, since no work not actually needed should be done.

As long as conditions exist as they are at present, with quantity of work fluctuating constantly, the yard workman will be continually insecure in his position, and will of necessity take the measures referred to, for his own protection. Hence the need for equalizing the demand for labor by the introduction of a well-designed manufacturing program, to offset the unavoidable unevenness of repair work. If the yard administration does its part well in the solution of the general problem, it is believed that the workman can be relied upon to do his.

Assume, for illustration, that a fairly constant demand for labor in all departments has been instituted, through the manufacturing of articles for naval use during periods of low demand for repair work (see "Manufacturing in Navy Yard"). The yard workman, feeling more certain of permanent employment, can now be approached with the following arguments: (1) Each yard, being

in competition with other yards, should endeavor to excel in efficiency and economy; (2) to so excel it is necessary for every individual to do his best; (3) by reason of excelling, the yard may expect a more constant supply of work, since the Department will have work done at that yard which does it best and cheapest; (4) by establishing a record for turning out manufactured articles cheaply, a greater volume of such work can be obtained; (5) inefficiency and extravagance will act automatically to check the supply of work, and to cause wide fluctuations in volume of work.

By impressing these ideas on the working force, it is believed that great advances in the direction of economy can be made. There is no question of the intelligence of the American workman, and he can see his advantage as quickly as any man. This has been proved by the success of the methods instituted by leading shop organizers throughout the country.

Mr. F. W. Taylor, in an address before the American Society of Mechanical Engineers, in June, 1903, stated, in reference to his work in making *time studies* that "he has over and over again seen the fact demonstrated that workmen of all classes are not only working, but glad to give up all ideas of soldiering, and devote all of their energies to turning out the maximum work possible, providing they are sure of a permanent suitable reward."

Time studies, meaning accurate recording of the time necessary for average good men to perform certain operations, with scientific premium rates of pay based thereon, form subjects which lack of space would prohibit going into here. They are mentioned, however, as indicating the road along which we must travel in order to achieve true economy. Briefly, it may be stated with perfect safety that there is no field in which the ideas of Mr. Taylor, Mr. Emerson, and other exponents of this school of economic engineering may be better applied than in our own navy yard plants. The subject is somewhat aside from the main objects of this essay, which are intended to relate mainly to the general financial conduct of navy yards.

It is necessary to imbue the workmen with a spirit of pride in the advancement of the yard towards efficiency. This done, harmonious action can be expected in all shops. On the other hand, no yard can be successful which has a body of dissatisfied employees working against the real interest of the plant. Foremen and leading men are particularly susceptible of increasing efficiency due to proper treatment on the part of managers.

CONCLUSION.

The writer has endeavored to make it clear that economy in navy yards can be generally introduced only by the installation of a thorough system of accounts which will cover absolutely all classes of expenditures, throw into relief the major extravagances, and block off or circumscribe the channels through which money flows in such a way that no part may escape into that indefinite region lying between "Military Expenses" and "Cost of Production." Every cent must go into one or the other, and be clearly tagged with its character.

It is, of course, possible to produce economies without reference to such an accounting system. As a matter of fact, an accounting system does not of itself produce any economies at all. It merely points out where the loss is going on, in order that better methods may be instituted. But the attempt to produce economy without the use of proper accounts is bound to be unsatisfactory. First because attention is confined only to obvious extravagances, which may be cured without realization of the effect on other parts of the plant. Second, because it is never easy, and sometimes impossible, to prove that better methods effect a saving. Third, because the efforts of a few reformers only are utilized on certain specific details.

On the other hand, economic results are obtained more easily after the introduction of good accounting methods. First, because extravagancies are shown up all along the line at the same time, and the changes in methods in one place are instantly felt in all other places affected. Second, the proof of economy produced is found in the resultant figures, which take account of everything. Third, because all departments of the plant have their extravagances brought home to them at the same time, and all minds are using their inventive faculties to better the results in local sections.

For the above reasons the writer considers that the most crying need in our navy yards at present is for sound accounting methods. These in effect, the modern shop planning systems, the time studies, the betterment of methods and the actual production of economies can go forward with full assurance of proof being available, step by step, that they are good. In the course of time there is every reason to believe that naval plants, instead of being at the bottom of the ladder of industrial efficiency, may be at the top, and serve as models for private plants to pattern by.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HONORABLE MENTION.

WANTED—A FIRST AID.

By COMMANDER C. C. MARSH, U. S. Navy.

Motto: Bricks Without Straw.

"Fenced by your careful fathers, ringed by your leaden seas,
Long did ye wake in quiet and long lie down at ease;
Till ye said of Strife, 'What is it?' of the Sword, 'It is far from our ken';
Till ye made a sport of your shrunken hosts and a toy of your armed men."

As bricks cannot be made without straw, neither can ships be fought without men. Two elements are required for this naval success—ships and men; and the goal should be that we have the best of each. A *great* navy is the demand of many; an *adequate* navy is the demand of practically all the people. But ask the man in the legislative hall, the man in the club, the man in the street, what he means by a great navy, and he will answer—battleships. Observe the newspapers, the conversation of intelligent men after the adjournment of Congress, and so far as interest in the navy is concerned, all are happy or depressed in proportion to the number of battleships Congress has added to the navy. The navy is *battleships* in the popular mind. Now there is an obligation on the part of the legislators and the professional men of the navy towards the people that is analogous to that of the family physician to his patrons. And the people will hold them to the same severe accounting that the physician should be held to, who, having observed disease in the body of a member of a family, failed to give notice of its existence and offer a remedy.

All that pertains to the material branch of the navy is well understood, because it is exploited daily. The public understands that with larger ships must come docks large enough to dock

them, the necessity for reserve power, guns, great reserve coaling bases, and large sums are being expended for these purposes.

But towards the *personnel*, the attitude has been the dangerous one of "laissez faire." In the gradual increase of the navy, the personnel has never been considered as an indispensable part of each new unit added to the material of the navy. Along with the battleships, with her armament, equipments, etc., has never been added a clause in the appropriation bill providing for 50 officers and 850 men. A certain number of years elapses; a certain number of new units are added to the navy, and then by a strong request from the Navy Department, more men are added to the navy. This very method of procedure shows some sort of a lack of appreciation of the true relations of the matériel and the personnel in the upbuilding of the navy. To avoid platitudes, yet to attempt to place the *personnel* and the *matériel* in the correct position of their relative importance, let us cite Napoleon who is quoted as saying:

that in every military campaign the personnel element counts three-fourths; all other elements one-fourth.

Or Farragut, who said:

In conclusion on this point permit me to say that I think the world is sadly mistaken when it supposes that battles are won by this or that kind of gun or vessel. In my humble opinion the *Kearsarge* would have captured or sunk the *Alabama* as often as they might have met under the same organization and officers. The best gun and the best vessel should certainly be chosen, but the victory three times out of four depends upon those who fight them. (Flagship *Hartford*, Mobile Bay, November 8, 1864.)

As a part of the duty of its military advisors to the people, is that of dispelling such illusions as are harmful. Of such is the Fourth-of-July oration that we can "lick the world." Even a cursory reading of history will show that we have never licked any one except where we were better trained for the specific purpose than our enemies. Other phrases, equally dangerous, are to the effect that "the Civil War was won by the private soldier," or the sense of security that seems to possess the people at the mention of the phrase—"the man behind the gun." Now, the man behind the gun is a part of the great naval establishment—he is not all. It is harmful to suppose he is. Between him an success lies the dragon he must master—*training*. For, by

man behind the gun is here meant the great number of young and very intelligent men in whom the people place the safety of the country. It is our imperative duty to show the country that a *trained personnel* is as important as are *battleships;* that a *trained reserve personnel* is as important as the *battleships in reserve.* It is necessary that it be understood that it was *recruits* that fought the first battle of Bull Run, and *trained men* who marched through Georgia to the sea. The same source supplied the men who fought with Villeneuve at Trafalgar, and with Suffren in the Indian Seas. It is the personnel that counts; it is the leader that counts, because the trained man is what the leader makes him.

A TRAINED NAVAL RESERVE.

The problem of a trained naval reserve is one that we must solve for ourselves. A study of the methods employed abroad will assist us but little. In fact, the path followed by the other powers is more likely to be to us what the frontiersman calls a "blind trail." For, in the first place, all great powers, except Great Britain, have compulsory military service. This alone places us in a class apart. In the second place, the powers that concern us most—England, Germany, Japan, France—have a large, and in some cases, rapidly growing merchant marine. They also have certain shipping subsidies, and a governmental control over both ships and personnel that will probably never be realized here. There are still other conditions that differentiate us from them. But in brief, the causes that force upon us the solution of our problem are:

a. The form of our government.
b. The character of our people.
c. Geographical conditions.

Causes (a) and (b) are closely bound together, the one being a reflex of the other. We are confronted with the two facts; first, the indisposition of our people to " in time of peace, prepare for war "; and second, that all military service, either in time of peace or war is voluntary. An effort will be made throughout this paper to emphasize the importance of ever keeping in mind the human element.

Cause (c) will be taken up in connection with the subject of organized and unorganized reserves.

DEFINITE REQUIREMENTS.

But to get from general to specific conditions, it is believed that the situation will be this:

A. That in the near future the navy will have in active commission twenty-one battleships, with cruisers, destroyers, submarines and miscellaneous vessels.

B. That there will be in "Commission in Reserve," with partial crews, twenty battleships, cruisers, destroyers and submarines.

C. That it will be imperative to complete to its full strength the first or battleship line.

D. That for this purpose there must be available, subject to the call of the President, 1000 officers and 15,000 men.

E. This reserve force must be organized, equipped and trained; must be mustered into the service without examination, or delays; must be able to reach the distant sea coasts in thirty-six hours.

How and where is such a force to be found?

By developing the present naval militia.

It is, of course, very clear that the personnel of the all-big-gun battleship of 1910 differs radically from that of the battleship of fifty years ago. But to make clearer this difference, there are given below the complements of the U. S. S. *Delaware* (1910), and the U. S. S. *Minnesota* (1863):

	U. S. S. Delaware.		U. S. S. Minnesota.	
Petty Officers (Line)	81		52	
Seamen	129		138	
Ordinary Seamen	190		145	
Landsmen	..		171	
Boys	..		44	
		400		550
Artificer Branch		52		..
Artificer Branch (Engineers):				
Petty Officers	66		..	
Firemen	100		25	
Coal Passers	112		33	
		278		58
Miscellaneous:				
Yeomen, Hospital Stewards, etc.	37		2	
Messmen	46		..	
		83		2
Total		813		610

In the old *Minnesota* the engineer's force was 9 percent of the total complement; in the *Delaware*, it is 40 per cent.

These mere figures, however, do not begin to tell the story. In the class marked "Artificer Branch" on the *Delaware*, apart from the painters, plumbers, etc., are twenty-eight electricians and four wireless operators. On the twenty-eight electricians devolves the care of all the machinery that operates every turret, ammunition hoist, fire-control apparatus and miscellaneous machinery. On the four wireless operators devolves the system of communications that alone makes possible the scouting, the dispersing and combining of squadrons, and all else that constitutes the strategy of the campaign before the fleets meet and the tactics after the battle begins. Nor is this all. Of the eighty-one so-called line petty officers, thirty-two are gunner's mates and turret captains, whose efficiency is rated far more by their mechanical than their seamanship qualifications.

It is impossible to imagine a similar number of men on the old *Minnesota* whose existence was as vital to the ship as are these men to the *Delaware*.

The conclusion is evident. The modern man-of-war is a marvelous machine, and for her operation requires *mechanics* of the highest skill.

It will be demonstrated later on that that absolutely necessary quality for naval efficiency—hitting the target—is being now accomplished in the fleet by young men enlisted from the interior of our country, serving on their first enlistment, and whose "sailor knowledge" is confined to that acquired in the few months in the navy.

With these facts (and they *are* facts and *not* theories) before us, it seems to be the part of wisdom, in formulating any scheme of a "reserve," that we recognize the requirements as they are, and endeavor to meet them. Traditions die hard. There is no tradition that is more reluctantly given up than that the "Naval Reserve" shall be recruited from "the sea-faring population," yachtsmen, etc. Such men are not required for the navy; they form a minute proportion either of the annual recruits or of any of our ships. Still, of such must be the naval reserve. We might as well bury the tradition. We are not dependent on that class, which is fortunate, because it does not exist.

It is clear, then, that the requirements are:

a. Skilled mechanics to fill all the mechanical ratings.

b. Intelligent, strong, young men, to be trained into the ratings of the seaman branch.

It seems inexplicable that in a country where the mechanical trades have reached the highest efficiency, and where technical schools are abundant, there should be any question of finding the necessary men to fill all the requirements of class (a). Nor, equally, that there should be any question of the necessary number of young men to fill class (b). The authorized enlisted strength of the navy is about 48,000 men. And the Navy Department is able, spite of the rigid mental and physical requirements, to keep its quota full. This, however, is difficult in the higher ratings in the skilled mechanical branches. The reason is simple. The skilled mechanic is, on shore, a well-paid man. The attractions of family, etc., are stronger than the desire to go to sea. In time of war, however, this is changed. Such men will go then. But that they may go quickly, that they may be made to feel they will step at once into billets in which they can serve their country by means of the skill they know they possess, they must be interested and educated in the nature of this emergency service they propose to render. Let us give one concrete example. A—— B—— is the chief boilermaker of the establishment of X—— Y—— in the city of Providence, Rhode Island. He is also a member of the naval militia of Rhode Island. As a member of the Rhode Island Naval Militia his interest in the navy is aroused, and kept alive. He cruises in summer on the small vessel assigned the State, or he takes his turn on the battleships for the summer exercises. The Navy Department prepares examinations for boilermakers, which he successfully passes. His name is so registered in the office of naval militia, and in the division of enlisted personnel in the Bureau of Navigation. War threatens. The naval militia of Rhode Island is ordered to report at the Boston Navy Yard. There are vacancies to be filled on the *Connecticut*, the *Vermont*, the destroyer *Flusser*, the ammunition ships and many others. Each man before he left Rhode Island had in his pocket the station billet of the ship to which he was assigned. He stows his bag and hammock; knows his station—perhaps had made his last summer cruise on that self-same battleship. There is the whole story. Multiply this instance by thousands and you see the invaluable function the naval militia can perform.

But What is the Naval Militia?—The naval militia is an organization consisting of 540 commissioned and warrant officers, and 5961 petty officers and men. There are local branches in twenty-one States. The members join that they may be trained in time of peace to serve in the navy in time of war.

The dates the organizations were created in the several States are given below:

	Date.		Date.
1. Massachusetts	Mar. 29, 1890	12. Louisiana	Sept. 11, 1895
2. New York	June 23, 1891	13. Ohio	July 26, 1896
3. California	Sept. 3, 1891	14. Georgia	Oct. 26, 1896
4. North Carolina	—, —, 1891	15. Maryland	—, —, 1896
5. Rhode Island	—, —, 1891	16. District of Columbia	May 11, 1898
6. South Carolina	Nov. —, 1892	17. Maine	Apr. 2, 1903
7. Pennsylvania	Jan. 6, 1893	18. Minnesota	Dec. 15, 1903
8. Illinois	Sept. 30, 1893	19. Missouri	Dec. 18, 1905
9. Connecticut	Nov. 27, 1893	20. Wisconsin	June 29, 1909
10. Michigan	Mar. 1, 1894	21. Indiana	Aug. 24, 1909
11. New Jersey	May 20, 1895		

In addition to the above there were organizations created in the States of Washington, Oregon and Florida during the present year, which organizations are awaiting the action of their several legislatures during the coming winter. In general, the naval militia is a part of the militia of the State, the phraseology being something to the effect that "such part of the State militia as the governor may elect shall constitute a naval militia." Up to the year 1903 the land and naval militias were upon practically equal terms. But by the passage of the Act popularly known as the "Dick Bill" (after its advocate and promoter, Senator Dick, of Ohio), the land militia became an organized national guard, subject to the direct call of the President of the United States, a status desired for the naval militia, and for which there is now a bill before Congress, introduced by Representative Foss, and favorably recommended by the House Naval Committee.

It will be seen from the dates of creation of the several organizations that they were not the result of any emergency, or threatened disaster, nor are they the result of any hysterical and ephemeral patriotic wave. They are the calmly thought-out desire of a body of patriotic citizens. Space does not permit an adequate description of the earnest work, the personal sacrifices of time and money, the hours devoted to study and drill, the discouragements, the rebuffs encountered by the officers and men of the naval militia in their determined effort to make organizations for

the benefit of the navy, and thereby for the general government. Attention is invited to the register of the commissioned and warrant officers of the naval militia of the United States, 1910, for in that publication will be found the refuting of so many mistakes that exist in the mind of the ignorant. It will there be seen, for instance, that of the seven captains, three entered the service in 1891, one in 1892, two in 1894, and one in 1901—an average service of nearly seventeen (17) years.

It will be seen that there is in the naval militia one captain for every 824 enlisted men; one commander for every 289 men; whereas, in the navy there is one captain for every 555 men, and one commander for every 375 men. The bulk of the officers is in the junior grades—enthusiastic, intelligent young men, capable of being developed into excellent officers.

Let is be stated here clearly and distinctly that the naval militia is what it is through its own efforts. The Navy Department has been reasonably generous in the granting of requests; it has advanced—offered—until recently, nothing. Let it be just as clearly stated here that the naval militia craves the sympathy and assistance of the navy. It is ready to follow wherever the navy will lead it, be it in the matter of training in time of peace, or into the thick of the fight in time of war. The naval militia is the ideal field from which to recruit and train just the men to fill the requirements outlined earlier in this article. It needs only to be directed, to be told what to do, and it will immediately set about fulfilling the directions given it. Let is be understood that up to the time of the war of 1898 the naval militia had been trained in nothing larger than a ship's cutter; that the naval militia is now manning completely, with its own force, vessels from the *Chicago* down. To illustrate the statement that the naval militia need but to be directed, let these instances be cited: The naval militia of the State of California, having passed from strictly shore and armory work to the U. S. S. *Alert*, consisted of eight divisions, of which seven were deck or seaman divisions, and one engineer division. When the *Alert* was replaced by the U. S. S. *Marblehead*, the necessity at once appeared for more engineers, for electricians and mechanics, and without even waiting for suggestions from the Navy Department, there were four more engineer divisions created. In Massachusetts, the naval militia (19 officers and 369 men) took the U. S. S *Chicago* for

a ten days' cruise. The ship's company was, in general, very complete, but strange to say was short on electricians. It happens that the officer in charge of the electrical division is in the employ of the General Electrical Company, of Boston, as well as having been four years at the Naval Academy. He was asked if he could not recruit an electrical force, to which he replied: "Certainly, from our own electrical works." It is unnecessary to multiply instances.

The officers are many of them graduates of the highest universities and technical schools. From such an education they have become men of great affairs. They are accustomed to issuing orders and having them obeyed. They have been given opportunity to take the course at the compass office at the Naval Observatory in Washington, and are availing themselves of it as the chance offers. They are given the benefit of the branch hydrographic offices throughout the country, and no organization is without one or more officers skilled in compass work. The contract between the Secretary of the Navy and the governor of a State requires, when a vessel is loaned a State, that the commanding officer and senior engineer shall have merchant marine licenses. Instead of this requirement applying to only these two officers, the States are requiring that every deck officer and every engineer shall have such a license. This requirement is the demand of the naval militia themselves.

WHAT IS THE AIM OF THE NAVAL MILITIA?

Simply, as stated before, to train in peace for war. But how? Their aim is to supply the Navy Department, on a telegraphic call, when emergency arises, a number of thousands of officers and men to be assigned to service as the Navy Department may deem best. It is important that this point be made clear. It will be explained later what is meant by organized and unorganized reserves, but for the present it is desired to explain that the naval militia (which is an organized reserve) has no belief that they can render the maximum service to the country by being assigned as an organization to any specific ship or duty. While conscious of their zeal and capacities, they are also conscious of their limitations, and believe that they can render the best service by being detailed as a part of the complements of ships already partly manned by the regular service. They will, therefore, when they

have reported at a navy yard, be detailed as the Navy Department elects, in numbers dependent on the requirements of each case.

In every system of education, be it for the regulars, or reserves, or militia, the education of the officers is of paramount importance. This is the age of specialists, and in the naval militia, by proper direction, an invaluable corps of specialists can be developed. Navigators can be found who are not necessarily either engineers or turret officers; electricians and engineers or turret and gun division officers have their special qualifications. From no known source can there be recruited officers who can fill all stations as can the officers of the regular navy who have given their life to the work. But it must be apparent that if there can be found in the naval militia, or elsewhere, an officer who can satisfactorily fill one station—engineer, navigator, or electrician for instance—he thereby sets free the officer of more extended attainments. These classes are mentioned first not because of their greater importance, but because they are those who bring their life profession with them when they enter the naval militia preparatory to entering the navy in time of war. The commanding, executive and division officers, no matter what their profession in civil life, must be trained for the specific work on board ship.

The records from the fleet show that midshipmen, with an education mostly theoretical, are assigned as seconds, or even as firsts in turret and gun divisions on the battleships, and given a deck watch in maneuvers. The records also show that the gun divisions under these young officers have made highest scores. This is specializing in its highest degree. And the writer believes that with a consistent and progressive system of training, most valuable officers can be trained in the naval militia, sufficiently advanced to enable them to take up duty on any class of ship on which they are a minority in a complement of regular officers and men.

The officers then, of the naval militia, expect to enter the navy in time of war in such rank, and such positions as they have been found qualified to fill. They desire to be given the opportunity to "qualify" and, having qualified, to be given rank and duty accordingly. The impression seems to exist in the navy that in time of war a naval militia organization, with a superabundance of high rank officers, will expect to enter the navy *as a body*, and be

assigned as such to a large ship, or to replace on such a ship regular officers and men of long service. Exactly the opposite is true, as, it is hoped, has been shown. In any case, the whole matter of the detail and assignment is in the hands of the Secretary of the Navy.

ORGANIZED AND UNORGANIZED RESERVES.

An *organized* naval reserve is a body of officers and men existing by authority of a national or state legislative Act and formed into units, "divisions," "battalions," or "ship's companies," according to the phraseology of the Act, and all united under one command.

An *unorganized* naval reserve, as its name implies, its without that combination of officers and men formed into units, but consists simply of individuals.

In the United States there is at the present time not one officer or man belonging to any *official national naval reserve,* organized or unorganized.

There is the imperative necessity for both an organized and an unorganized naval reserve. There is no conflict between the two; they are each to serve their important purpose, in their own way.

The *organized reserve* is to fulfill the requirements of the title of this paper—"WANTED—A FIRST AID." Since the whole body of an organized reserve lives in one locality, or at least is subject to one command, it is always to be ready to respond *as a body* to the call of the President. The whole organized reserve of the United States should be at the sea coast within thirty-six (36) hours from the hour of the issue of the call, or it has failed of its function. Diplomacy, fear of giving undue offence to the power with whom relations are strained, and with whom war threatens, will surely cause the delaying of mobilizing reserve ships until the last minute. When that fatal moment does come, our only hope is to be able to complete the first line of battle in the quickest possible time, and with the most efficient possible force. With an organized reserve, every detail can have been perfected in advance. Every officer and man can have his station billet in his pocket. It will need only a telegram to effect the rest. To illustrate, even from our own small experience, let there be cited the following from the records of the Spanish-American War:

Navy Department,
WASHINGTON, D. C.
April 23, 1898.

(Telegram) To Adjutant General Samuel Dalton, Boston, Mass.

Send *Prairie's* complement officers and men to her at once at Brooklyn Yard. (Sd.) T. ROOSEVELT.

This despatch was received in Boston at 1.30 p. m., April 23, and the whole force—officers and men—was at the New York Navy Yard at 9 o'clock the next morning. Had the *Prarie* been at the Boston yard, or had the complement been selected from the New York militia, the order would probably have been complied with in six hours.

It is with the idea that this case, representing a small force, may at the proper time in the future represent a force sufficient to mobilize the entire reserve fleet that the organized reserve is regarded as a necessity.

It is, therefore, recommended that the government adopt and consistently pursue a definite policy concerning the creating and developing of a organized naval reserve. To this end, it is recommended that the strength of this force be:

1,000	Officers.
15,000	Men.

The solution of this problem is rendered simple by reason of the fact that there is an organized naval reserve, consisting of 540 officers and 5961 men, known by the title of naval militia, and which has for years been knocking at the door of the Navy Department asking for admittance to the ranks of the nation's defenders, asking for a more definite status, asking for more thorough instruction, asking for more responsibility, and asking in return nothing but the privilege of serving in the navy in time of war.

It has been stated above that the naval militia is a part of the volunteer militia of the States, such part, in fact, as the governor of the State may elect. It has been clearly demonstrated that the governor and the State legislature are willing to increase the size of the naval militia in proportion as they make good, in proportion as the demand for increase is impressed upon them. It is certain that in proportion as the Navy Department lends assistance, shows interest, gives encouragement, the naval militia advances. It is believed that not only can the size of the organized

naval reserve above set down be attained, but that the requests for enlistment will be such that only the best men need be accepted.

Until the year 1903 the militia, land and naval, was a militia pure and simple. It could only be called out by a requisition on the governor of the State, who complied or not as he saw fit. The militia could not be compelled to serve outside their own State. There was no governmental control whatever. If there is one point made clear in his remarkable book that General Upton has left us on the military policy of the United States, it is the necessity for a—

National Army of Volunteers and
Long Enlistments.

Our history is replete with instances of campaigns that could not be pushed to completion by reason of "short-time men," or campaigns abandoned by reason of "time-expired men." More than a hundred thousand men were called out at intervals by State governors for the defence of Washington, only to have the capital city fall a prey to a handful of British who found no one to oppose them. To remedy all these defects there has been passed by Congress the before-mentioned Act known as the Dick Bill, which, however, applies only to the land militia. To establish an organized naval reserve there is now before Congress the "Act to Promote the Efficiency of the Naval Militia and for Other Purposes."

This bill provides:

That in the event of war, actual or threatened—or rebellion—or whenever the President is unable with the regular forces at his command to execute the laws of the Union, it shall be lawful for the President to call forth such number of the Naval Militia as he may deem necessary—and to issue his orders through the governor of the State *to such officers of the Naval Militia* as he may think proper.

That whenever the President calls forth any part of the Naval Militia he may state in the call the period for which such service is required, and the Naval Militia so called shall continue to serve during the term so specified, *either within or without the territory of the United States, unless relieved by order of the President.*

PROVIDED: That if no period be stated in the call of the President, the period shall be held to mean the existence of the emergency, *of which the President shall be the sole judge.*

That every officer and enlisted man of the Naval Militia who shall be called forth in the manner hereinbefore prescribed, shall be mustered for service without further enlistment, and without further examination pre-

vious to such muster, except for those States (if the case may so be) which have not adopted a standard of professional and physical examination prescribed by the Secretary of the Navy for the Naval Militia. PROVIDED, however, that any officer or enlisted man of the Naval Militia so qualified who shall refuse or neglect to present himself for such muster, upon being called forth as herein prescribed, shall be subject to trial by court martial, and shall be punished as such court martial shall direct.

That the Secretary of the Navy is to provide for the participation by any part of the Naval Militia in any cruise, maneuvers, etc., of the regular Navy.

Authorizes the Secretary of the Navy to permit officers or enlisted men of the Naval Militia to attend at any naval professional school, or on board ship.

Authorizes inspections, and detail of Naval officers as instructors of the Naval Militia.

Authorizes the establishment of an "eligible list" for reserve officers. By this is meant that the Secretary of the Navy may prescribe qualifications, and prepare examinations suitable for each grade of each corps of the Navy. That officers of the Naval Militia may be given an opportunity to take such examinations, and if successful it shall entitle them to be enrolled on the list of "eligibles," and in time of war to be commissioned in the Navy in accordance with the rank in which they have qualified.

(All other features of the bill are administrative matters and need not be quoted here.)

This bill may not be perfect. A similar bill has enabled the army to make great strides towards the establishment of an efficient and increasing organized national guard. With such a bill as a base upon which to stand, the navy can build a structure proportional to the time, the patience, the heart it puts into the work. Defects, which time proves to exist, can be remedied by the same legislative body that passes the creative Act.

Unorganized Naval Reserve.—This desirable body should consist exclusively of—

The desirable discharged men of the navy.

To be limited to 50,000 men.

A bill has been introduced into Congress providing for a reserve of this character.

With two such reserves, it is believed the navy can face an emergency with a confidence it cannot now feel.

There is, it is believed, a confidence existing in the minds of the navy and the people regarding both the number and the character of the men who will flock to the colors in time of war that is not justified by the facts.

We may assume that the patriotic feeling will bring in, in time, sufficient men for all the requirements of the navy. However, it is the imperative necessity for men at the outset—men sufficient to man the reserve ships, to complete the first line of battle—that is our greatest requirement. Illustrations of more than one point will be drawn from the recent Japanese-Russian War. In no particular is the lesson more instructive than in this that when the Japanese began war on February 6, it was the *Japanese Navy* that sailed from Sasebo, moving on to its advanced base on the Russian frontier from which it never receded.

ENLISTMENTS IN THE SPANISH-AMERICAN WAR.

In view of the often-expressed belief that in time of war there will be a regular stampede towards the naval recruiting stations, the return of the discharged man-of-war's men, the reported thousands of American sailors on the Great Lakes, etc., let us examine the following figures from the Report of the Bureau of Navigation, Navy Department, for 1898:

FOR THE YEAR—JUNE, 1897-1898.	MEN.	APPRENTICES.
Applications for enlistment	71,112	3,212
Rejected for physical disabilities and other causes	63,135	2,269
FOR THE YEAR—JUNE, 1898-1899.		
Applications for enlistment	38,687	3,069
Rejected for physical disabilities and other causes	31,346	2,154

These figures show the great necessity for some weeding-out system.

The real point is, however, the enlistments as they actually occurred. They were:

During the year 1898, month of—	
April	2,314
May	3,660
June	2,910
July	1,228
August	237
September	109
October	205
November	187
December	225
	11,075

In other words, it took two months, including a period of five weeks, after war had been declared to get 5974 men. It must be remembered that the U. S. S. *Maine* had been blown up in February. Relations with Spain were most strained. War seemed inevitable, was declared on April 21, and the country was elated over the victory in Manila Bay on May 1.

The 5974 men enlisted during two months are less than the strength of the present naval militia, which, as an organized naval militia, is available on telegraphic call, and should be on board ship in thirty-six (36) hours.

It will be observed that of the applicants for enlistment about 12 per cent were accepted. It is further a matter of record that of the 11,075 enlisted, the naval militia furnished 3832. And as an additional instance of the value of preparation, the records show that when the naval militia organizations presented themselves for examination for enlistment, there were accepted between 85 and 95 per cent. The number enlisted for the war was 11,045. The strength of the navy at the time was 12,500. In other words, the strength was doubled. By a similar token, a war at this time would require an additional 45,000 men. Each year that passes will increase the need for a reserve; for the reason that each year adds to the "ships in reserve." At the time of the Spanish-American War the effective navy was in commission. Little if anything was added that increased the real fighting strength of the navy, a condition that will not exist again.

It is believed that the foregoing demonstrates the necessity of an organized reserve, and the means by which it can be created.

The *unorganized* reserve is to consist of the desirable discharged men of the navy. By the payment of a small "retainer" these men are to enroll themselves in the Navy Department, and be available in time of war. It is presumed that they left the navy because they prefer to take their chances in civil life. Their character is such that we must assume they attain even more than an average success. With success in business will naturally follow the interests inherent in human nature—wives, families, homes of their own, local affiliations. To regain these men in time of war will be a priceless boon for the navy. To create such a reserve is invaluable. It is a question, however, that needs must be carefully considered as to whether these men, with the in-

terests as enumerated, will be able to meet that instant response so much needed; whether to arrange their affairs will not require a few days here, perhaps weeks. Admitting that such is the case, the value of the plan is in no sense diminished. For, with the first emergency met by an organized reserve, the individuals of the unorganized reserve come just in time to man the later ships, to fill vacancies, and to furnish the trained leaven to the mass of recruits that are being enlisted.

There is, however, one feature that is likely to be lost sight of, and which is vital to any plan of reserve that is dependent on voluntary service. This feature is the "human element." Man by nature is a gregarious animal; he loves the contact, the association of his fellow men. This is illustrated not merely by the crowding of the population into the cities from the country, but by the further and more intimate grouping of men into clubs, into the so-called "secret societies"—the Knights Templar, Odd Fellows, and many others—whose total membership amounts to millions. Men who have a common interest desire to get together, at least at intervals, to discuss those interests. It is frequently called talking "shop." To keep going a movement that is once started it is necessary to assemble the members to exchange views; it is necessary to inject a certain amount of the social into the "shop." This is the experience of the world. It is believed that herein lies the danger of an unorganized reserve. With the individuals located at places rather remote from each other, with no common meeting place, with no enthusiast to keep alive the interest of the more or less indifferent, we must not be surprised if the organization falls to the ground by reason of a lack of a cementing force. This is shown to a degree in the navy league of the United States. The writer has discussed the subject with isolated members, and has been told exactly what is set down above: To keep the interest alive, the members must get together. The fact remains that in a population of some ninety millions, and with the navy at the pinnacle of its popularity with the people, the membership of the navy league is still small. Nor must any analogy be drawn from abroad. In England, for instance, all ports are practically sea ports, and all England is interested in matters concerning the sea.

THE COST.

It is not easy to estimate the cost of an institution the existence of which may save a nation's honor. Still, since the question is asked "What will it cost?" meaning dollars and cents, let the answer be given in dollars and cents. The general government appropriates each year for "Arming and Equipping Naval Militia," $100,000, increased this year to $125,000. This pays for the uniforms, small arms, and equipments, coal for cruising, ammunition, medical stores, etc. The force thus provided for numbers 6500. The government further loans to the naval militia organizations vessels, boats and certain equipments for training purposes, and keeps the vessels in repair. This sum, when charged up against the organizations, more than doubles the expenditure. It has been the practice heretofore to loan to the naval militia vessels that were of little value to the navy. Vessels of such a character were expensive, as is any old type and largely worn-out machine. The system adopted by the Navy Department this year, however, will result in greater economy to the Navy Department, and vastly greater benefit to the organizations being trained. This system consists in loaning to the naval militia, or in placing in "Commission in Reserve" and assigning them to the naval militia for training purposes, vessels that have a real military value—vessels that when war is declared will be called into active service. It can readily be shown that by maintaining the vessels in this status, always ready for service, is a distinct financial gain to the Department, entirely apart from the valuable service they are rendering in the building up of a trained personnel. For instance, the gunboat *Detroit* cost, while lying at a navy yard, out of commission, and therefore receiving no care in her up-keep, $530.00 per month; and the small cruiser *Boston* cost $750.00 per month. Both these vessels were recently stricken from the navy list and advertised to be sold as being unfit for repair.

But from any point of view, education is an article of great cost, as any man of a family will testify. Or, seen from another point of view, if we take all the property making up the educational plant of a city, and add to its value the expenditures in salaries and wages, and divide this by the school attendance, or by the number of graduates, the cost per individual turned out will be astounding.

In the case in point, however, the mind must not divorce itself entirely from sentiment; this particular education, the training of a "Reserve," is not merely to save the billions of dollars that an unsuccessful war will entail, but it is to save as well the nation's honor.

FOR WHAT SHALL THE RESERVE BE TRAINED?

The answer is simple. The "Reserve" should be trained as are trained all recruits, all officers and men who are to serve in the navy, for general service. It is not necessary to enter into the discussion as to what will be the character of the service of the reserve in time of war, whether it be in the "first line," "inner line," or what. The Navy Department in its wisdom will assign the most fit to the most important stations, of which it will be the sole judge. The difference between the more fit and the less fit should not be a question so much of the character of the training as of the degree of excellence attained. No organization, regular or reserve, can claim for itself any duty it is manifestly not qualified to fill—the claim must be based on the ability to perform the duty. In this particular, it is believed profit can be derived from the experience of others. There existed in England up to the year 1903 an organization known as the Royal Navy Artillery Volunteers. The duty of this organization was to man certain coast defence fortifications, smaller vessels operating along the coast in rather restricted waters. In fact, the duty was distinctly confined to local waters. In that year—1903—a commission was appointed to inquire into the matter of reserves. The conclusion of this commission, in brief, was that it was best to return to the old Nelsonian doctrine that the "enemy's coast line was England's frontier," and that the matter of a coast defence of the character implied in the duties of the Royal Navy Artillery Volunteers was abandoned, and that organization was wiped out of existence. Henceforth, there was to be no class of reserve not available for all kinds of duty, and the training was to be given in the British home fleet. On the abolishing of the above-mentioned body a new one was created to be called the Royal Navy Volunteers. This is an organized naval reserve, the only one in England, and its nature is exactly like our naval militia, with that further control by the general government that might be expected in England, and which is the hope of the naval militia for their own

organization here. It seems to be inevitable that the same spirit that actuates a man in time of peace to join a "Reserve" organization, will actuate him in time of war to be keen to get to the front. It is a splendid manly spirit that is worth fostering. The question then remains—can he be sufficiently trained, and if so,

HOW SHALL THE RESERVE BE TRAINED?

The answer to this question again is simple. It consists in developing, improving, perfecting the system that is being now employed with the naval militia.

There is no question but that the naval officer will welcome any efficient body of "Reserves." He is willing to lend a hand in the training of those reserves. It is also equally true that the naval officer who falls in with the naval militia becomes convinced of the value of that body.

WHAT IS THE PRESENT SCHEME OF TRAINING OF THE NAVAL MILITIA?

By their regulations they are obliged to attend at not less than twenty-four drills during the year, and to take part in the summer exercises. This is a mere outline—the minimum requirements. To nearly every organization throughout the country a naval vessel of some type is now assigned. On this vessel are made many short cruises in addition to the annual cruise. This will be found to be in excess of the requirement of almost any naval reserve in the world. The scheme that is being developed in the training of our naval militia—worked out in all ignorance of any system employed abroad—is, however, the embodiment of the doctrine that the enemy's coast line is our frontier, and that all reservists must be available for all kinds of duty. All training that does not bear directly on naval duties have been abolished. The armory work during the winter is made to bear directly on the work afloat during the next summer. To this end let there be cited some of the apparatus supplied the armories, and the character of the instruction books issued:

Signals.—An ardois, two illuminated semaphores, two complete sets of signal flags, hand semaphores, and wig-wag.

Ordnance.—A 4-inch (or 3-pounder) gun, latest type of mount, with Morris-tube apparatus, telescopic sights, etc. A sub-target gun. All vessels assigned the Naval Militia are equipped with either two 4-inch or

two 3-pounders, depending on their size, and competitive target practice is to be held under strictly naval requirements.

Navigation and Seamanship.—The armories and ships are equipped with all necessary training gear. The libraries are supplied with ample books, and the compass course at the U. S. Naval Observatory in Washington has been thrown open to the Naval Militia officers, and such a number have either taken the course there or have availed themselves of the branch hydrographic offices throughout the country, so that all organizations have navigators versed in the compass.

In accordance with the plan that all training should be strictly naval, and that the officers and men should be familiar with naval practices, the following books and pamphlets have been prepared and issued during the current year:

NAVAL MILITIA PUBLICATION.

No. 1.—Training of Gun Pointers.
No. 2.—How to Stand Watch.
No. 3.—Method of Conducting Target Practice.
No. 4.—Tactical Signal Book for the Use of the Naval Militia.

The following are some of the publications purchased and issued:

Hints for Junior Officers Doing Line Duty.
On the Management of the Ships in a Fleet.
The Modern Officer of the Watch.
On the Care and Management of Steam Machinery and Boilers.
Nulton on the Compass.

The above are essentially for the education of the officers, and have been especially selected, or prepared, for that purpose. They are additional to the standard works on all professional subjects, and to the books issued for the education of the enlisted men, such as—Petty Officer's Manual, Boat Book, Recruit's Hand Book, Ship and Gun Drills, etc.

With the preparation derived from the winter's study and drills, the season's work begins about May and lasts till November. It will be too long to do more than give a summary of the character of the summer's exercises. Where possible, groups of naval militia vessels are assembled for what may be called squadron drills. This is particularly true on the Great Lakes, where squadron exercises have been held for several years. Regarding these exercises, suffice it to say that the vessels are manned, navigated, maneuvered exclusively by the naval militia. And it is no slight tribute to the skill of the officers to state that this squadron navi-

gated at eight-knots speed, preserving good distance and formation, through the St. Claire Lake and River, and the Detroit River from Lake Huron to Lake Erie, encountering the immense mass of shipping that traverses those waters, at one time finding themselves on the Lime Kiln Flats with three lines of passing merchant vessels abreast, and yet never having a break in the formation. On the Atlantic Coast the Massachusetts Naval Militia, with 369 officers and men, manned the U. S. S. *Chicago* on a cruise from Boston to Hampton Roads and return, encountering dense fog, and rough weather, and, with their own navigator, entered and left both Boston and Hampton Roads without a pilot. The Connecticut Naval Militia accompanied the *Chicago*, manning the *Machias*. The California Naval Militia cruised in the *Marblehead* from San Francisco to Bremerton, Wash., via Portland, Ore., and returned to San Francisco. The Louisiana organization cruised similarly in the Gulf of Mexico on the *Isla de Luzon*, and other organizations made equal cruises in the vessels assigned them. Two points call for especial notice as emphasizing the progress in the training, and the attitude of the Navy Department in this matter of the naval militia.

These are the placing of valuable naval units "in commission in reserve," assigning them to the naval militia for training purposes, and the assignment of the naval militia to the battleship fleet for the period of their summer exercises. In the first instance, the U. S. S. *Chicago*, *Ozark*, *Tonopah*, *Amphitrite* and *Cheyenne* have been so assigned this year. In the other instance, the assignment of the naval militia to the battleship fleet for their exercises, neither the navy nor the naval militia can adequately express their gratitude to the present commander-in-chief of the Atlantic fleet for the interest he has shown in this matter of reserve training, and for the precedent he has established in this regard. One week of his own summer program he set aside, and fourteen battleships were detailed for the excluside training of the naval militia. The plan is to assign about sixty men and four officers to each ship. The naval militia thus see the latest type of ship, under the normal conditions of naval life. It is believed that by a plan that involves a system of alternation between the battleship fleet, and exercises on their own State assigned vessel, the naval militia, or by whatever title the naval reserve is called, will be given the nearest approach to ideal training.

The subject of how the naval militia is being trained has been gone into at some length, at the great risk of tiring the reader, because the gist of the whole matter lies here, that if this system is correct, or approximately so, it need only be improved, and perfected and applied to any reserve, organized or unorganized, that may be created.

This, then, is believed to be the situation—that there are required an *organized naval reserve* of 1000 officers and 15,000 men. and that the instrument is at our hands in the naval militia; and an unorganized naval reserve of 50,000 men to be recruited from the desirable discharged men of the navy.

The recommendations from the Navy Department for the creation of a naval reserve have contained the same phraseology for many years. They involve the incorporation of the Revenue Marine Service, Light House Service, Coast Survey, Merchant Marine and yacht squadrons. It would seem that this scheme is along the lines of robbing Peter to pay Paul. It would seem that the duties devolving upon all the above bodies, with the exception of the last, will be as important in time of war as in peace. The British government has awakened to the fact that if it called the Royal Naval Reserves into the navy, its invaluable merchant marine must either be laid up or pass into the hands of foreigners.

These facts prove that our reserve must be created apart.

Much can be done by legislative action; much by Departmental aid and sympathy; but in a country where all military service, as well as the preparation therefor, is voluntary, a " Reserve " is only possible when it is created by a serious and patriotic impulse within the hearts of the people. The inculcation of this spirit should be begun at home. It should be developed practically at schools, and every high school in this country should include military training.

Sons of the sheltered city—unmade, unhandled, unmeet—
Ye pushed them raw to the battle as ye picked them raw from the street.
And what did ye look they should compass?
Warcraft learned in a breath,
Knowledge unto occasion at the first far view of Death?
* * * * * * * * * * * *
But ye say, " It will mar our comfort." Ye say,
" It will minish our trade."
Do ye wait for the spattered shrapnel ere ye learn how a gun is laid?
For the low red glare to the southward when the raided coast towns burn?
(Light ye shall have on that lesson, but little time to learn).

KIPLING.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ON THE TRUE RELATIONS BETWEEN THE DEPARTMENT OF THE NAVY AND THE NAVAL WAR COLLEGE.

By REAR-ADMIRAL S. B. LUCE, U. S. Navy.

1. The sole reason for the existence of the Navy Department is the probability of war.

2. The most important office in the Navy Department (after that of the Secretary of the Navy) is the office of naval operations.

3. All other offices in the navy are merely subsidiary to that one particular office—the Office for the Conduct of war.

4. The several bureaus of the department, the navy yards, and naval stations generally, each and all, exist solely for the one great end—to contribute, each in its own way, to the successful conduct of war under the Secretary of the Navy and his chief director of naval operations.

5. Inefficiency in this one office (the office of naval operations) means the wreckage, in time of war, of the entire system. Hence the supreme importance of the office cannot be exaggerated.*

6. Military history teaches that a general staff, composed of officers specially instructed in staff duties, is a necessity. Says a high German authority: †

> The General Staff forms an essential part of a modern army organization; . . it has grown in importance with the numerical increase of modern armies, and the development of military training and efficiency.

* It means, in short, naval disaster in war and national humiliation, as in the cases of Cervera and Rozhestvenski at Santiago, Cuba, and Tsushima, respectively.

† General Brousart von Tchellendorff on "The Duties of the General Staff."

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7. "The Staff College" (for training officers for duties on the general staff) "owes its origin to the experience of the Great King (Frederick) in the Seven Years' War."

8. It has now come to be well understood that what is true of a land army, in this respect, is equally true of a sea army. A naval general staff, under whatever name may be preferred, is absolutely necessary to the proper conduct of naval warfare with this marked distinction: that a naval general staff is a small and very simple organization compared to that of an army.

9. To prepare officers for duty on the general staff requires special training—as for any other specialty.

10. For the training of officers for staff duties, staff colleges have been established (see par. 7).

During his last campaigns, Napoleon began to reap the advantages of an institution which had been under his fostering care, and a host of distinguished young generals fully justified the praises which the Emperor lavished on his "poulet aux oeufs d' or," the hen that laid him golden eggs.

11. The Naval War College, which is essentially a staff college, was established for the express purpose of training officers for naval staff duties.

12. The object was to enable officers to prepare themselves by a course of conscientious work, for duty in the most important office in the Navy Department next after that of the Secretary of the Navy, namely: for the Office of Naval Operations.

13. Through want of understanding the importance of the War College, together with a misconception of its true character as an educational institution, the Navy Department has failed to reap a tithe of the benefits the college had to offer.

14. The annual conferences of only four months' duration, and their often inconsequent conclusions, have deluded the service at large into the belief that the college had nothing better to offer.

The real work of the College has been done by the members of the staff during the winter months. To refute the service idea that the College has "no studies of utility," it is only necessary to call attention to Rear-Admiral Mahan's great works on Sea Power, which were first given out in the form of lectures delivered at the College. There are many other valuable papers which have been developed by the staff members, and used by the Navy Department.

15. During the past twelve years of its existence the request for additional officers to carry on the college work has been met by the assurance that there were "no officers to spare."

16. It is not the lack of officers that has retarded the development of the War College. It is the lack of appreciation on the part of the naval service of the relative importance of naval duties. The profession has nothing higher of attainment than the mastery of the art of war.

17. On the scale of educational values, the War College stands at the head, not even excepting that great School of Application—the fleet. For War College training means the direction of the operations of the fleet.

18. Appreciation of relative educational values would suggest that, in the assignment of officers to duty, the Naval War College should receive the very first consideration. A War College diploma should insure the holder the most important duties the navy has to offer.

19. Of every ten officers who pass through a term of a year or more of Naval War College work, there will not be more than one, or at most two, who will develop an aptitude for the particular kind of work required on the general staff. An officer may excel in ordnance or in gunnery; he may be a good linguist or a mathematician, and yet discover no aptitude whatever for the work of planning naval campaigns. Nevertheless, in every instance, conscientious application to the War College course has broadened the officer's mind and vastly increased his capacity for higher tactical command. Hence the double necessity for passing the greatest possible number through the mill; first, to prepare the many for the higher commands which will come to them in their professional career; secondly, to discover the few fitted to fulfill the requirements of the Office of Naval Operations.

20. The Spanish War forced into existence the semblance of a staff under the name of "The War Board."

21. An outgrowth of the war board of the Spanish War is the present *General Board* which was designed originally to perform all the functions of a naval general staff and to have nothing whatever to do with matériel.

22. The navy regulations of 1909 provide that the General Board "shall coordinate the work of the Naval War College, the

Office of Naval Intelligence and the Board of Inspection and Survey." (Chap. 1, Sec. 2, par. 5). This provision of the regulations effects a complete change in the character of the college. It diverts it from its original purpose as an educational institution; converts it into a part of the organization of the Navy Department, and imperils the plan for the higher education of officers which was the main object in the establishment of the college.

23. To sum up: it is quite clear from the foregoing that the true function of the Naval War College is *educational, not executive.* It is not a war board, nor a naval general staff. It forms no part of the *working organization* of the Navy Department, but supplies the material wherewith to construct such an organization. It devotes itself to the study of naval history, naval strategy and tactics, the law of nations, and *academic discussions* of all conceivable types of naval problems of war; it supplies the alumni from which to select officers competent to command our fleets as well as those able to solve correctly the *actual* problems with which a naval general staff is bound to be confronted, a duty generally of a nature so confidential as to prevent its being delegated elsewhere, and which should be the sole function of a board sufficiently strong and able to constitute, both in peace and in war, the backbone of the Department of the Navy.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FIGHTING EDGE

A TRACT FOR THE TIMES.

By Lieut.-Commander W. P. Cronan, U. S. Navy.

"Of all these, the Belgae are the bravest, because they are farthest from the civilization and refinement of our Province, and merchants least frequently resort to them, and import those things which tend to effeminate the mind; . . . ." *Cæsar's Commentaries, Book I.*

"History repeats itself" is an axiom which is particularly true in military and naval annals; had Cæsar been an admiral he might well have complained of the enervating influences of protracted stays in the Roman navy yards where his crews would doubtless have been pestered by those itinerant vendors of whom we find the modern prototypes in Sands Street and in the Great White Way.

Let us take well to heart the lessons of naval history, ancient and modern, as well as those which are analogous in campaigns on land, for the ethics of all fighting are the same, and what was true in 1812 and 1861-65 is true to-day as far as personnel is concerned.

In these days of high living and luxury, cold storage and ice, we may well ask ourselves if the fighting men of to-day have kept pace in themselves with the development of the equipment for war at their disposal.

I make a plea for the predominance of military ideals in all our modern naval training, rejecting, without sentimentality, all that has become obsolete.

Times change, and the improvements in the arts and sciences far exceed any corresponding improvement which can be noted in the fitness for war of the human being.

Were John Paul Jones alive to-morrow, it may be assumed that with only a superficial training in the general features of modern equipment, he would make a first class commander-in-

chief of a modern fleet; he possessed the fighting edge, the power and ability to place military ideals and aims above all else.

We are told that Collingwood was a finer seaman than was Nelson—but there seems to be no doubt in the minds of students of naval warfare that Nelson was the better naval officer.

Seamanship is an art, and a most attractive and necessary one; but the best seamen are born, not made, whereas organized naval warfare is a science, the attentive study of which is the paramount duty of every naval officer.

In 1865 the navy of the United States was, to all intents and purposes, 20 years ahead of its time; it comprised a military fleet, of heavily armed and armored ships, of which we may say one at last, the *New Ironsides,* was a logical precursor of the modern all big gun ship.

Yet it was not a fleet in the true sense, because it was not homogeneous in type, nor did the exigencies of the service require it to be handled as a co-ordinate whole against an enemy's fleet. But our navy was on the right track—it was military and its ideals were those which beget success in war.

The writer, while at the War College in attendance upon the conference of the summer of 1909, was much impressed by the remarks of Rear Admiral Sperry upon this subject, in relation to the necessity of maintaining a military fleet as the backbone of a navy; as well as I remember, that learned officer referred to anything else as "a mob of ships."

If we had a mob of ships in 1865, what, in all charity, can we call that heterogeneous collection of naval antiques which in 1885 were inferior in military effectiveness to their predecessors of more warlike days?

A long period of enervating peace during which the only naval event of importance, to judge from written records, seems to have been the visit of the frigate *Congress* to the Centennial Exposition in 1876, succeeded the civil war; the traces of the Collingwood ideals engendered in this period are still with us.

The dignified and stately rites attendant upon post-prandial crossings of top-gallant and royal yards, to the querulous and fitful piping of multitudinous boatswain's mates, I fear were held in higher favor than the perfunctory performance of less spectacular duties with the obsolete batteries: this within the memory of many who have not yet dined in solitary state, "cribbed, cabined and confined."

There are those of us who have served in modern fighting ships, the atmosphere of which was perhaps not military; where the celerity with which all boats were cleared away and stood off under sail equalled that which we are told obtained in the days of the "*Swatara*"—"*O sepulchra sacra.*"

A splendid thing—a pretty thing;—but the time and attention devoted to the high degree of perfection attained in boat sailing was being used by another ship in painstaking training in the minute details inseparable from success in elementary gunnery, the results of which were apparent at the next target practice.

It is a pretty sight indeed to see a well-trained gig's crew of six good men and true pulling three miles against a leeward ebb on an official visit, but in these days of efficient gas engines, tended by one man, the gig, if engined, might get there and back much sooner and the other five men be kept at more important tasks.

It is nothing but maudlin sentiment which makes us retain a single drill or evolution or custom of the past which detracts from the efficiency of the present.

The greatest room for the employment of skill on the part of a naval officer of the line is in the training and development of the personnel; ours is fortunately of the best type; our men are young and their minds are plastic; the high degree of efficiency which can be attained within a short time, during short enlistments, is best evidenced by the notable strides which have been made in gunnery.

Since 1902, which marks the advent of what the writer chooses to call the Renaissance, there has been a steady and marked improvement in the efficiency and tone of the service, due to a solid and firm adherence to military ideals, as indicated by the constant improvement in gunnery, the development of which has reacted favorably upon the whole service.

If any division officer of the fleet be asked what men of his division give him the least cause for concern and need the least supervision in regard to neatness and personal appearance it is undoubtedly true that he will name the men who hold the most responsible military positions, as gun pointers, gun captains, hoistmen, plugmen, etc.

They have received the preponderance of military training, and it has reacted favorably upon their bearing as man-of-warsmen.

Attention to detail in the uniform, and above all else, to the manner in which it is worn, is the soul of discipline on board ship.

In a stroll through the streets of a foreign town during the visit of our fleet on the cruise of 1908, it would need no more than the casual glance of a practiced eye to separate the men of the U. S. S. *Efficient* from those of the U. S. S. *Mediocre* without so much as a glance at a cap ribbon—(save to see that the ends were taut).

It is not enough that our modern man-of-warsman should shoot straight—he will do that with enthusiasm, but prefers to do it in dungarees, and that tendency can only be overcome by a rigid insistence upon exactness in uniform and military bearing; the one can and should go hand in hand with the other.

As a general rule, the smartest men at muster are the gun pointers; the reason why, because they carry the mark which shows their skill, and perhaps, also, that gift of the gods, the " E " which denotes supremacy.

It is not without good purpose that the All-wise Creator put curly feathers in the game cock's tail.

It is not necessary to be dirty to be efficient—let us strive to make smartness in uniform and bearing the result of military efficiency and prowess. One cannot blame the crew of the U. S. S. *Efficient* for being cocky because their ship excels in gunnery—for it is more than probable that she also leads in the steaming competition; has the best race-boat's crew and baseball and football teams. If, then, her men are the more apt to keep their neckerchiefs tied aright and cuffs turned down far from the piercing eye of the master-at-arms, may we not say that we have come into our own?

It may be asked what relation careful attention to the petty details of uniform and bearing have to the military efficiency of the fleet—in the writer's opinion it has a great and far-reaching influence.

The long period of training through which the British fleet passed under the iron rule of Jervis prepared its personnel to gain the triumphs which followed the supreme tests under Nelson's leadership—without that training and consequent esprit de corps, Nelson's genius would have been of no avail.

In keeping our helmet strings taut, it is not too much to ask that they be knotted properly and in the right place.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SHOULD THERE BE AN INTERNATIONAL NAVY?

By Commander T. W. Kinkaid, U. S. Navy.

1. Looking back at the inception and history of the Hague Tribunal, it must be conceded, I think, that the institution has "made good." Its sessions have been attended by some of the most able representatives that the countries of the world could summon; and at least several of the agreements reached at the conferences have commanded wide respect and have made for lasting peace. Quoting James Brown Scott's "Texts of the Peace Conferences": "Since the meeting of the First Hague Conference, four great and important cases have been submitted to the Hague Tribunal, have been adjudicated, and the judgments cheerfully and promptly accepted by the litigating nations."

2. But such progress as has been achieved to date has come in spite of an obvious defect of plan. To be sure, there are many peace-loving and well-intentioned enthusiasts who contend that the Tribunal as now constituted and supported is practically sufficient in all respects for considering and solving all questions that are likely to disturb the world's peace. But, on the other hand, those persons whose contention is that no permanent or great good can be accomplished by a court that has not a backing of adequate military force are doubtless in a great majority. Quoting Scott again: "It may be maintained that international law is law in the strict sense of the word, or it may be contended that it lacks an essential element of law, because there is no international sheriff."

3. Considering the situation of our own Supreme Court, our citizens are at all times more or less conscious of the fact that the decisions of that august body are entitled to and in case of necessity would receive the backing of the entire military force of the country administered by the President and supported by the Congress.

4. The criticism that the Hague Tribunal has no military support need not always exist. The object of this brief paper is to suggest that the leading nations of the world unite for the formation and maintenance of an international navy.

ORGANIZATION AND MATERIEL.

5. Let us assume that in the beginning a special conference of representatives of twelve of the leading nations has brought into existence a treaty binding each of the high contracting powers to contribute to the international fleet a force consisting of twelve first-class battleships, twelve torpedo-boat destroyers, and three scouts, all fully manned. Here we have to start with:

144 battleships
144 destroyers
36 scouts.

6. Each contribution of twelve battleships should involve the detail of three flag officers, preferably with the rank of rear-admiral.

7. It is not the object of the present writer to offer a perfected scheme of command; but it seems necessary to suggest a plan for determining the three or four ranking officers of the fleet.

8. It is proposed that there be designated by election, each flag officer having one vote, one high admiral, one admiral, and one vice-admiral. Thus would the supreme command be provided for under whatever contingencies would be likely to arise.

RENDEZ-VOUS AND DRILLS.

9. The treaty authorizing the fleet should make due provision for securing such neutralized harbors and islands as would be necessary for the overhaul of the materiel, and for exercise of ships and personnel near shore. If several suitably situated islands in the Atlantic and Pacific Oceans, having good and commodious harbors, and good grounds for infantry drill purposes, could be secured, the fighting efficiency of the great force could be maintained at all seasons.

MAINTENANCE.

10. It would undoubtedly be necessary for the several contracting nations to withdraw a vessel or vessels from time to time, replacing those withdrawn by others in good repair. It could reas-

ably be expected that each of the nations would take pride in furnishing as its fleet representatives the best vessels of the authorized types that it could produce.

11. It is suggested that the furnishing of its quota of vessels to the international fleet should not in the least degree debar a nation from carrying out any building or maneuvering program that it might choose to indulge in. But, should the project of an international fleet realize the hopes of the present writer, the maintenance of a large individual naval force in addition to the international quota would within a few years be manifest folly.

12. Contributions of money for the support of the fleet should of course be provided for in the treaty.

SECESSION.

13. It is suggested that the treaty should provide that none of the contributing nations should withdraw its vessels or its personnel without giving at least six months' notice of its intention so to do; and that it should be the sworn duty of the commander-in-chief to prevent, by force if necessary, any withdrawal of vessels or personnel except in accordance with the provisions of the treaty.

USE OF THE FLEET.

14. Assuming that the formation and organization of the fleet are realized, how shall it be directed and used? I cannot conceive of any better source of authority than the President of the Permanent Court of Arbitration. At once there comes to mind the enormous responsibility and power that by this plan must be invested in one man. Will the nations ever reach an agreement as to this question? Will they make the Hague Tribunal the Court of Courts? Will they make the president of the Court virtually President of the World? Perhaps a prolonged campaign of education will furnish the answer.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ADVANCE BASE TRAINING.

By Major Henry C. Davis, U. S. M. C.

The discussion relating to the marine corps, and the ultimate employment of that corps, has occupied the minds of many service people for the past two years. It is not with any desire to discuss the question of its use on board ship, which was so thoroughly gone into by Congress in the winter of 1908-09, that the writer gives his views, but rather to propose something which he believes will be of immense benefit to the marine corps and thus to the naval service. There has been established by the marine corps, at the naval station at New London, Conn., a school known as the "Advanced Base School," and the officers assigned there are doubtlessly receiving an amount of instruction in a little known course which will be of intestimable value to them. However, up to the present time, in so far as the writer is aware, the instruction is purely theoretical. To be of lasting benefit and value to these officers and to the marine corps, this theoretical instruction must be supplemented by the practical work which would be performed by an advance base force in the seizure of a designated spot.

How are we to give this instruction to any such force?

If we assume, for discussion, that a commander-in-chief will not, except as a last resort, deplete his forces afloat by the detachment of a portion of them to seize and hold a spot as an advance base, it at once becomes apparent that some force additional to the fleet force must be available for that duty.

There is no such force available at the present time *as a force*. There are men who have had work at different times and places in connection with such military operations but we have no body of men trained for the work and whose officers have had practical experience. What force can we take and train for this most important work?

There are on duty in the United States, on the east coast, marines who are available for this as well as their routine navy yard duties. These men are doing the things that perfect the recruit in his duties; they are receiving the training that is necessary for all soldiers at the outset of their military careers; but, aside from their target practice and parade ground evolutions, they are not learning the things that are so essential to the soldier in the field.

This is not a criticism of the system but a statement of what is being done at the majority of posts in the United States. The drill the men receive in battle formations and tactics is largely, if not wholly, confined to the drill they can receive on a rather small parade ground. Its scope is necessarily as limited as the parade ground.

I wish to impress upon the reader the fact that these statements are not made in a spirit of criticism but rather to show that what I propose is not only feasible but most desirable.

The question then is, "How train a force for advance base work?"

It has been the custom for many years for the Atlantic fleet to have its target practice and other fleet drills each winter in Guantanamo Bay, Cuba. Every winter, when the fleet goes there, I would mobilize at Norfolk, Va., a regiment of marines, fully officered and organized, and, with ships which the navy has available for transports, I would embark this force provided with the advance base outfit as outlined by the general board. This force I would have at the disposal of the commander-in-chief and he should be instructed to use it as he would in time of war in the occupation of an advance base. The actual crew of the transport I would limit to the force necessary to run the ship's machinery, man the boats, cooks, mess attendants, electricians, etc. The transports would then be convoyed by the fleet, or a portion of the fleet, and conducted to the rendezvous as though a state of war existed. Arriving at the rendezvous the regiment should make its preparations for landing with the advance base outfit and establish itself exactly as though on active service. The vast bulk of the advance base outfit, it must be understood, would of course take much time in landing, but the thing should be gone through just as though we were doing it to hold the spot from an active enemy.

Can anyone doubt that such training would be of the greatest

value to officers and men? Would not the expense be as much justified as that connected with the annual army maneuvers?

The result would be that we would have a body of men who would have had the practical experience necessary for success in time of war. On the other hand, by neglecting to so train a sufficient force of officers and men, we are liable to have to take a green outfit of both to do work which appears vastly important to me.

Lieutenant-General Von der Goltz, in his book "The Conduct of War" (page 86), says, "However much their military expeditions may have been characterized by audacity, yet all great commanders have attached the highest value to the possession of a good base." And again on page 92, "A fleet and a land army can afford one another immense support in pushing forward a base if the theater of war is bounded on one side by the sea."

While these quotations hold more for army than for naval bases, yet the importance of having some immediate force ready to take and hold an advance base cannot be too highly estimated. It may even arise that the advance base taken primarily for the navy may from necessity be later occupied and used by the army.

Mr. Lea in "The Valor of Ignorance" (page 224) says, "Navies are not self-sustaining in any degree whatsoever. Nothing that is necessary for their maintenance can be gotten by them out of the sea. The vast theater of war where their campaigns are made and battles fought is as barren as the desert. *In consequence, naval bases are as necessary as fleets in every sea where nations have established or expect to extend their suzerainty.* (The italics are mine.) And further he says, "The security of naval bases rests fundamentally with their land defense." These statements are based on the idea of the United States taking and preparing the territory already owned by them, but, inasmuch as there appears to be no likelihood of the United States doing this in time of peace, there is all the more reason why we should have ready and trained a body which can at least offer sufficient resistance to an enemy until reinforced by the land army which any defense needs.

There will doubtless be objection to this plan of going each year to the South for drill. Some will complain of being routed out of their homes for three or four months; others will base their objections on their experiences with previous floating battalions;

and the author frankly states that if the experiences of these latter officers have not been magnified he in no way blames them for their objection; but there will be this difference, that this force will have a definite object and a definite time of operation, and that when this is finished it will be returned to its stations. It must be understood that it is by no means intended that this regiment is to be kept with the fleet or that it is to be used except as a force to be instructed in advance base work.

So thoroughly do I believe that this programme will give us the training we need that I would recommend a force of similar strength to be used in Cape Cod Bay every fall for similar drills.

The outfit which goes to Cuba in the winter should, before returning to the United States, be taken for a trip to Europe both for the benefit of the men from the sea experience and also for keeping that part of the Government's announcement on the enlistment poster which offers an opportunity to see foreign countries.

Because our men have not the ingrained respect for discipline and authority found in other armies and navies, due to our different ideas of caste and social relations, we are apt to call it "independence of thought and spirit," characterizing the other men as mechanical in the performance of duty, etc. *Nothing could be further from the truth.* Our independence of thought and spirit too often turns out to be the pride of ignorance, whereby men, through some peculiar mental process, are ashamed to ask "How" and "Why" even when they are ignorant of the subject at hand.

The great ignorant public is too prone to pat the rankest militiaman or the rawest rookie on the back and tell him he can lick the world, and the poor ignorant rookie and militiaman believe it until they have met trained soldiers. Then their blood pays the bill which ignorance always presents.

But to go back a bit. Suppose such an outfit as suggested is on its way to some rendezvous for drill; how could it be occupied? Naturally the first consideration is that of landing the force after arrival and to do this the ships' boats, helped out by some flat bottomed lighters, would be necessary. Then, under the protection of the fire from the convoy or some designated ships, the debarcation would take place just as though in service.

After a foothold is gained we must begin the landing of the material of the advance base outfit. While this is being done by a portion of the force others would be preparing the land defenses.

gun emplacements and store houses, laying out camp, clearing the ground, etc.

All those things which would have to be done in active service could be done by this and similar forces once or twice a year and the result would be that we would have a force at the disposal of the Government *always ready and trained for its work.*

The question of the administration of discipline while the troops were on board might cause some discussion; however it is believed this point could be settled between the commanding officer of the ship and the commanding officer of the regiment on board.

The time will come when we will be called upon to perform work which foreign armies have found it takes years to teach men; then we will find that our men who are "so quick to learn" are but little better than a flock of sheep. They won't have time to learn and it won't be their fault that they don't know. It will be the fault of those who are in positions to know the importance of such training yet deny us the opportunity to obtain it. The responsibility for our ignorance will be placed by the public on the shoulders where it belongs, and then the loss of important places will bring home the shortsighted policy of neglecting every real preparation for their defense. Only when we have tried and have seen the willing but ignorant application of force to the problem in peace time can we realize what the result will be in war.

We must therefore begin now and we must work constantly to secure even a passable degree of efficiency in a class of work entirely our own and of which we should make a specialty.

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NAVAL STRATEGY IN A WAR BETWEEN ENGLAND AND GERMANY.

By PROFESSOR WILLIAM HOVGAARD, Late Commander Royal Danish Navy.

The following discussion must of necessity refer chiefly to certain simple political combinations, and it is admitted that the reality may be very different and much more complex. Moreover, war is rich in accidental occurrences, and whatever may be unstable in the existing conditions is liable to be overturned in wartime, whereby unexpected events, military, political and social, may happen, which upset all previous calculations. It might therefore be considered useless to indulge in speculations, such as those contained in this article, were it not that in time of peace it is necessary to form a theoretical basis, on which to build up the system of preparation for war, and on which to predict its probable outcome. Such a basis can only be obtained by a careful and critical study of the existing strategical situation on the theater of war, followed by a discussion of the probable flow of events during the war under the different political conditions most likely to obtain. The following article is an attempt in this direction.

The principal theater of war is in the present case the North Sea and the Baltic. Operations on shore are discussed only in so far as they influence directly the naval operations.

I. THE PRESENT STRATEGICAL SITUATION ON THE NORTH SEA AND THE BALTIC.

The strategical situation in these waters has recently undergone great changes, partly due to the rapid development in naval power of England and Germany, partly due to changes in the disposition of the naval forces and their bases, and finally due to the

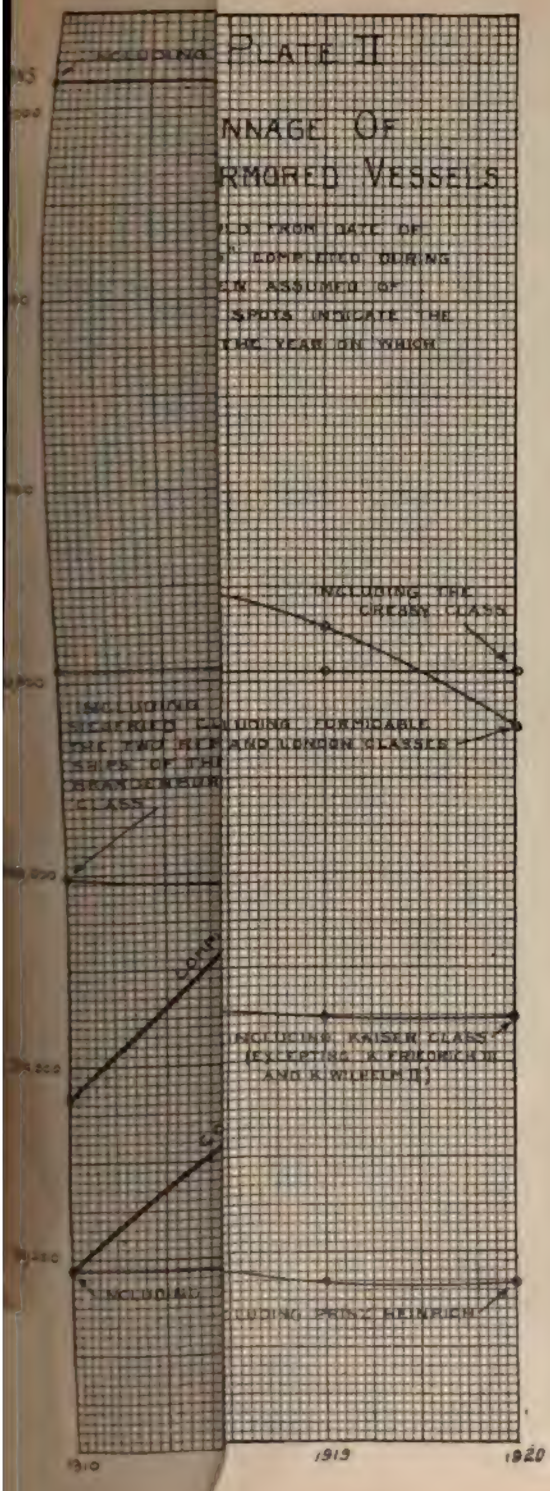


PLATE II
INCLUDING THE CRESSY CLASS
INCLUDING KAISER CLASS (EXCEPTING K. FRIEDRICH III AND K. WILHELM II)
1910
1919
1920

COMPARATIVE TABLE

FOR ENGLISH AND GERMAN ARMORED SHIPS NOT LESS THAN TWENTY THREE YEARS OLD FROM DATE OF LAYING DOWN

	ENGLAND								GERMANY							
END OF	COMPLETED "DREADNOUGHTS" (BATTLESHIPS AND CRUISERS)		"PRE-DREAD-NOUGHT" BATTLESHIPS		"PRE-DREAD-NOUGHT" ARM. CRUISERS		TOTAL		COMPLETED "DREADNOUGHTS" (BATTLESHIPS AND CRUISERS)		"PRE-DREAD-NOUGHT" BATTLESHIPS		"PRE-DREAD-NOUGHT" ARM. CRUISERS		TOTAL	
YEAR	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS
1910	10	183,000.	49	714,000.	34	407,000.	93	1,304,000	5	93,000.	30	288,000	9	95,000.	44	486,000.
1912	22	445,000.	49	714,000.	34	407,000	105	1,566,000	13	264,000.	29	294,000.	9	95,000	51	653,000.
1914	31	675,000.	41	602,000.	34	407,000	106	1,684,000	21	460,000.	22	253,000	9	95,000	52	808,000.
1920	55	———	25	377,000.	34	407,000	114	———	33	———	18	224,000	8	84,000	59	———

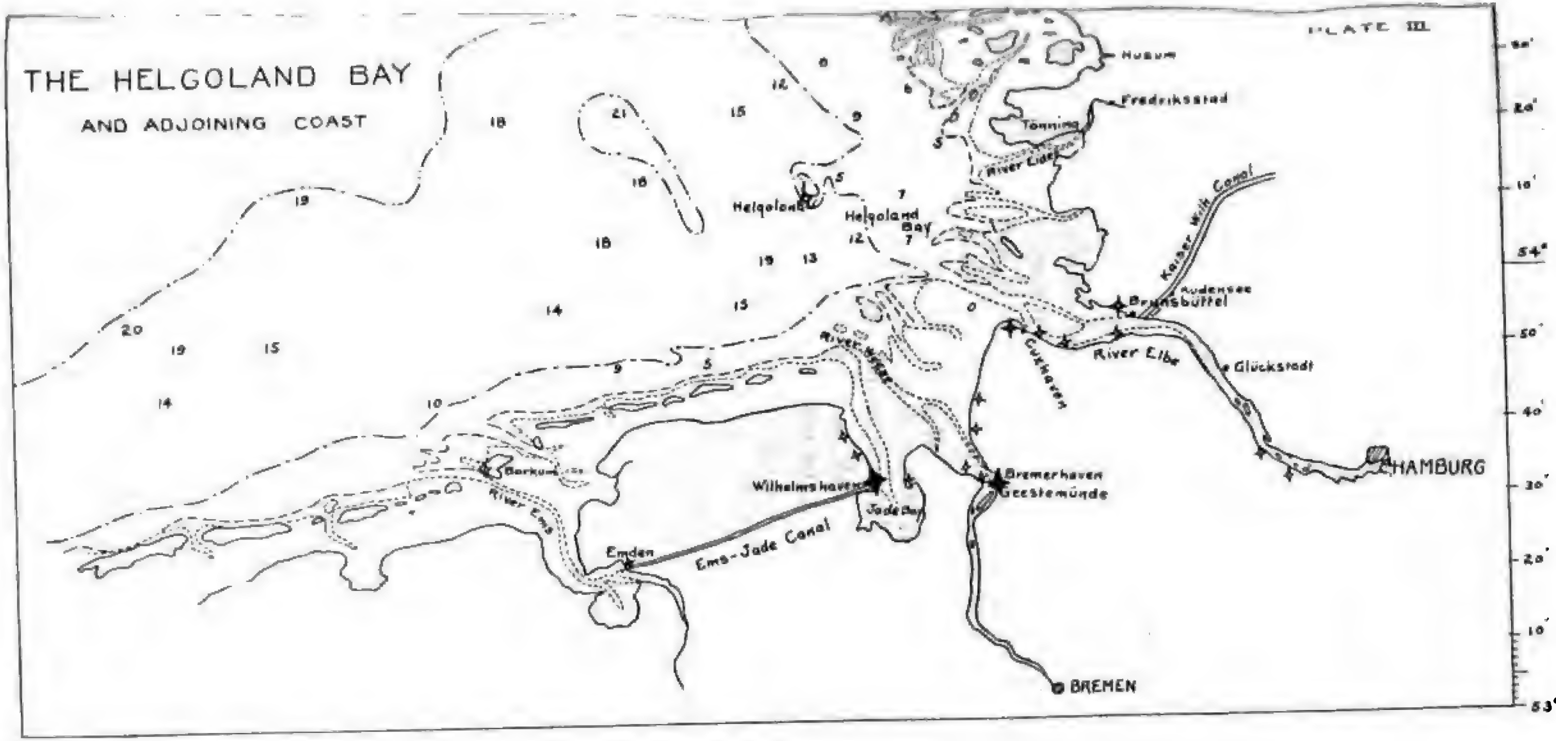


PLATE III
THE HELGOLAND BAY
AND ADJOINING COAST
Husum
Fredriksstad
Tönning
River Eider
Helgoland
Helgoland Bay
Brunsbüttel
Audensee
Kaiser Wilh Canal
Cuxhaven
River Elbe
Glückstadt
HAMBURG
River Weser
Bremerhaven
Geestemünde
BREMEN
Wilhelmshaven
Jade Bay
Ems-Jade Canal
Emden
Borkum
River Ems
54°
53°

navies will be provided with such ships in a measure corresponding to their strength in armored vessels and with due regard to the special needs of the respective navy.

2. *German Naval Bases.*

Considering first the North Sea, the German coast forms a right-angled corner, at the bottom of which is found *the Helgoland Bay*. (See Plate III.) This bay connects through the Jade with Wilhelmshaven, through *the Kaiser Wilhelm-Canal* with Kiel and through the Elbe and Weser with the Hamburg and Bremen districts, by far the greatest centers for German shipping. This bay is therefore of immense strategic importance, and great efforts are being made to protect it by developing the coast defense and by fortifying the island of Helgoland.

Helgoland is situated in front of the bay, about 20 miles from the sandbanks on either side, and controls to some extent the entrances. A harbor for small craft, to be used especially as a base for torpedo vessels, is being constructed at a cost of about eight million dollars, and will be completed by 1914.

Wilhelmshaven has, during recent years, been enlarged at a cost of about twenty-five million dollars, and the high-sea fleet as well as the newly formed flotilla of submarines, are now stationed in this port. It has, in fact, become the principal naval base of Germany, and is said to be the second largest naval port in the world.

Cuxhaven, near the mouth of the Elbe, is an important point of refuge for the fleet and is strongly fortified.

An enlargement of the *Kaiser Wilhelm-Canal,* which will permit ships of the "Dreadnought" class to pass, is now in progress. The depth of the canal will be increased from 30 ft. to 36 ft., and the breadth will be doubled. This work is to cost fifty-five million dollars, and will probably be completed by the end of 1914.

Along the south shore of the Canal, near its outlet into the Elbe, between Brunsbüttel and Kudensee, a new naval station is being constructed at a cost of about eight million dollars. This station is to comprise a harbor, 36 ft. deep, with a large floating dock, a torpedo-boat harbor with a smaller floating dock, coal depot, machine shops and depots of ammunition and mines. This station may be considered a branch of the dockyard in Kiel; it

is to form a safe place of refuge and of assembly for the fleet and will be useful for repair and supply. It will probably be completed at the same time as the canal. The fortifications at Brunsbüttel are being strengthened.

Some fifty miles westward of the Jade we find the fortifications of *Borkum*, protecting the entrance to the Ems. This river is adjacent to the frontier of Holland, and is thus the most westerly outlet on the German coast. Although Borkum lies outside the Helgoland Bay, it belongs to it strategically, inasmuch as the Ems is connected with Wilhelmshaven by the Ems-Jade Canal, which is navigable for destroyers. A torpedo station is found on the Ems at Emden.

Similarly the *Eider*, which has connection with the Kaiser Wilhelm-Canal, forms a débouché for torpedo vessels on the eastern entrance to the Helgoland Bay.

Although the coasts of *the Helgoland Bay* are studded with fortifications, it is to be noted that the inner line of communication between Kiel and Wilhelmshaven is not complete. In order to pass between Wilhelmshaven and Brunsbüttel, ships have to cross the open bay for a distance of some 20 miles, rounding the sandbanks between the mouths of the Jade and the Elbe. Formerly this navigation could take place in relative safety, since the German cruisers and destroyers might drive away hostile torpedo craft, but in a future war conditions will be different, due to the advent of the submarine boat. A blockading enemy may now push his submarine boats into the bottom of Helgoland Bay, and these cannot easily be driven away. It is likely, moreover, that an enemy would make extensive use of mines. Thus the stretch of open wâter between the Elbe and the Jade may be rendered entirely insecure to pass for the German ships, and in fact the whole bay may be rendered insecure. It appears, therefore, that a canal between the Jade and the Elbe is much needed to complete the connection between the two great naval ports, and thus secure the advantage of "interior lines" in an absolute manner.

A blockade of the Helgoland Bay proper, placed as it is in a corner of the North Sea, would at first sight appear relatively easy to carry out on account of the small arc to be watched, viz., a channel of about twenty miles width on each side of the island of Helgoland. Cruisers, which may succeed in passing the blockading vessels unseen, for instance on dark nights, will, on the

next morning, if going north, find themselves in the middle of the North Sea, and going west, they cannot have reached farther than the eastern entrance to the channel. In either case they are liable to be discovered and intercepted by the enemy before they reach the ocean, and before they can do any serious injury to English commerce. Sorties by the German battle fleet will probably be observed and reported before the fleet has proceeded far into the North Sea. It is, however, to be noted, that German torpedo-boats and submarines have an excellent advanced base in the new harbor of Helgoland. Moreover, the right wing of the blockading force will be exposed to attack in the flank and rear by such craft debouching from the Ems, wherefore the mouth of this river must be closely watched by a blockading enemy. Similarly the left wing will be threatened with attack of torpedo vessels from the Eider. Mines will be planted outside the bay.

There is to be taken into account, moreover, the general inclemency of the climate, the prevailing strong westerly winds often accompanied by rain or snow, and the frequent fogs; further the dangerous nature of the coasts.

The blockading service is therefore likely to be connected with great losses and to be exceedingly wearing both to the personnel and the matériel. The need of an advanced base will be strongly felt.

Turning now to the Baltic, we find in the western part the great naval port *Kiel*, in the eastern part the navy yard at Danzig.

From Kiel the North Sea, and hence the ocean, can be reached, not only by way of the canal, but also by way of the Danish waters. The navigation goes through the three international channels, which connect the Baltic with the Kattegat, viz., the Sound, the Great Belt and the Little Belt, and thence through Kattegat and Skagerak to the North Sea. See Plate IV.

Of these channels only the Great Belt can be passed by large ships, in the modern sense of this term, and is in fact to be considered the military highway between the Baltic and the Kattegat. The Great Belt is, however, difficult to navigate for large ships, and like the two other channels it may be easily mined or controlled by submarine boats and torpedo-boats.

Also the Kattegat presents considerable difficulties to the navigation of large ships, which, under many circumstances, have to move with great caution, and hence become liable to submarine attack of various kinds in the presence of an enemy.

These difficulties of the Danish waters, inherent in the hydrographical conditions, are, however, of great advantage to Germany on account of the nearness of these waters to Kiel. In fact, as long as no other power has obtained a foothold in the Danish waters, and as long as Denmark remains neutral, they can easily be controlled by the German Navy.

The Skagerak is 60 miles wide at its narrowest part and is difficult to blockade or even to watch effectively. It is deep and free from shoals, it cannot be mined, and a high speed can be maintained in navigating it, whereby the dangers of submarine boats may be eliminated.

Once the Skagerak is passed, the distance to the ocean is relatively short and the navigation simple. Hence it may be said that the Skagerak, considered as a gateway to the ocean, is much more direct and less dangerous to pass than the Helgoland Bay. Likewise, and for the same reasons, Skagerak is better adapted than the Helgoland Bay for making sorties or raids into the North Sea, whether with large or small forces.

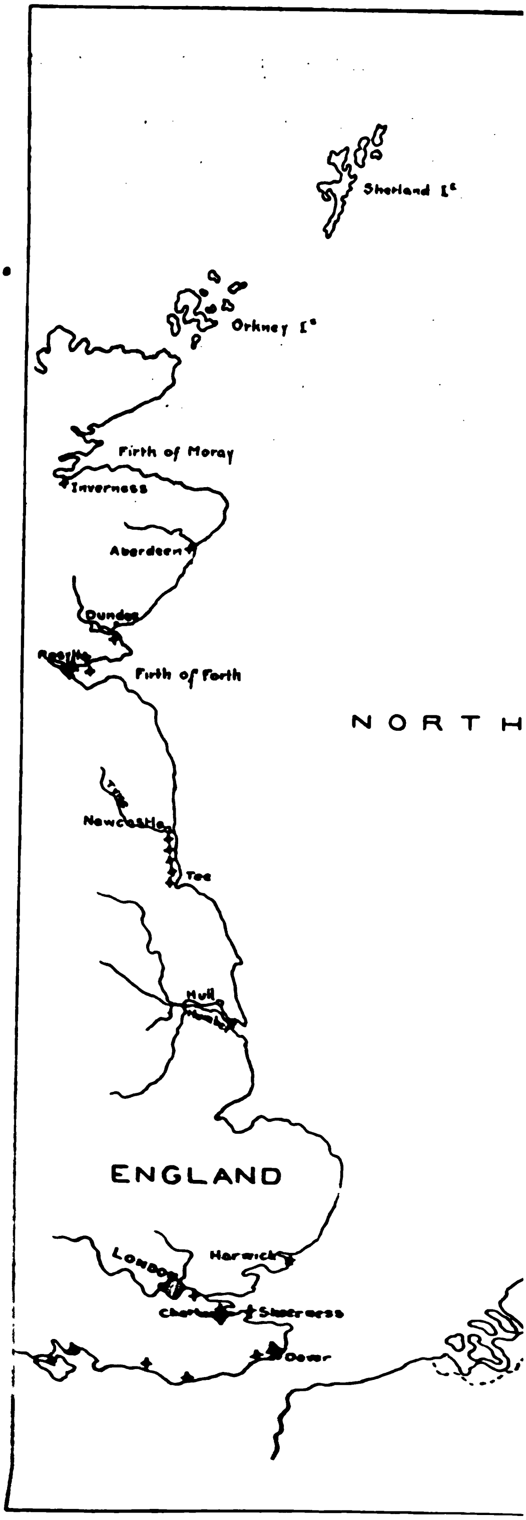
3. *English Naval Bases on the North Sea.* (See Plate IV.)

The development of the Helgoland Bay as the principal center for the German Navy has had its counterpart in a concentration by England of her naval strength in the Home Fleet, and in an effort to station this fleet more and more on the North Sea.

A naval port has been built at Dover at a cost of about eighteen million dollars, and a new base is being formed at Rosyth on the Forth. While Dover, which is practically without dockyard facilities, is to be considered chiefly a port of assembly and refuge, it appears to be the intention in course of time to make Rosyth a base of the same rank as Portsmouth. The station as now planned is, however, according to press reports, on a more modest scale, and comprises only one large dock, which is to be ready for use in 1914, while the entire station is said not to be completed before 1918. Recently it has been decided to build two more docks at Rosyth.

The principal base on the East Coast is still Chatham—Sheerness with its extensive dockyard facilities. At Harwich is found a base for torpedo craft.

At all the important harbors on the East Coast fortifications are found, which in combination with submarine boats will pro-



Shetland Is
Orkney Is
Firth of Moray
Inverness
Aberdeen
Dundee
Rosyth
Firth of Forth
NORTH
Newcastle
Tee
Hull
Humber
ENGLAND
LONDON
Harwich
Sheerness
Dover

PLATE IV


NORWAY
Kristiansand
Lindesnæs
SKAGERAK
SWEDEN
Skagen
Frederikshavn
KATTEGAT
DENMARK
Jutland
Esbjerg
COPENHAGE
The Sound
Zealand
Great Belt
Little Belt
Fyen
Falster
BALTIC
Kiel
Brunsbüttel
Cuxhaven
Helgoland
Bremer haven
HAMBURG
BREMEN
Weser
Elbe
Ems
Canal
GERMANY

vide ample security against attack as long as the English fleet is in being. Moreover, these harbors will probably be used as temporary stations for cruisers and destroyers, and will thus never lack protection. The immediate protection of the coast need therefore not influence the choice of location of naval bases.

Rosyth is particularly well located as a base for the English main force in a war with Germany, since the Forth is about the same distance, 375 miles, from Helgoland and from the Skagerak, and the navigation from the Forth to these two places is perfectly clear and simple. Chatham and Dover are indeed somewhat nearer to Helgoland, but are considerably farther away from the Skagerak, and the navigation from these ports is anything but simple for large ships, especially in foggy weather. While, therefore, torpedo-boats, submarines and all the vessels directly employed in the blockade of Helgoland Bay would naturally have their base in Dover, Sheerness, Harwich and other ports on the East Coast, the gros of the fleet might, with advantage, be concentrated on the Forth and only seek Chatham or the Channel ports when necessary for repair. Stationed on the Forth, the fleet would be less exposed to attack by German submarines and torpedo-boats than would be the case in the Southern ports, which are nearer Borkum, and which are situated in waters more favorable to the navigation of such craft. The fact that large ships, stationed on Rosyth, are able to go at high speed as soon as they are outside the port, would reduce very much the danger from attack by submarines.

Whether the Forth with Rosyth, possibly in conjunction with other Scotch fjords, will be able, in a near future, to give safe anchorage and harbor space to the entire English main fleet with complete protection against submarine attack, seems, however, doubtful. Perhaps it will be necessary for the fleet to concentrate in the less advantageous positions on the Nore and in the Channel.

A base at *Scapa Flow* in the Orkneys has been proposed; it would flank the northern outlets of the North Sea, but would be of importance only if a close blockade of the German coasts could not be carried out.

A *canal between the Forth and the Clyde,* navigable for large ships, would, under the same circumstances, be of great strategic value, and has been the subject of much discussion. In would put Rosyth in direct and safe communication with the great shipbuilding district of the Clyde; it would afford a covered line of

connection between the Channel ports and the Forth, and would in general procure the advantage of "interior lines" between the East and West Coast.

4. *Technical Progress.*

The *increase in size and draft* of ships of all types, which has taken place in recent years, has greatly restricted the field of action of modern fleets, especially in such waters as the approaches to the Baltic and the southern part of the North Sea. It has made navigation in such waters more difficult and therewith enhanced the danger of all forms of submarine attack, and in particular of submarine boats.

It is not accidental that the growth in the size of large vessels has been accompanied by a very forced development of the submarine boat. The two movements are indeed correlative, since the increase in size of capital ships has, at least partly, for its object to render them more resistive to submarine attack, while the very increase in size and cost of individual ships has greatly stimulated the development of submarine boats.

The submarine boat is now recognized as a necessary link of the naval force, useful for defensive and under certain circumstances also for offensive purposes. Recent large types of submarine boats are capable of navigating everywhere in the North Sea under all conditions of weather. Thus the German boats U_3 and U_4 have, in November, 1909, made the voyage from Cuxhaven round Skagen to Kiel, 540 miles, in 40 hours, *i. e.*, at an average speed of 12½ knots. The boats had no escort.

Technically then, *i. e.*, as far as seaworthiness and endurance are concerned, there is no difficulty in sending submarine boats from one side of the North Sea to the other, and while they may not be suited for cruising about or for attacking ships independently in the open sea, it does appear possible to station them for some time off the port of an enemy. In the daytime they will remain submerged, keeping lookout intermittently through periscope, and being ready to seize any chance of attack; during night time they will keep connection with the atmosphere and if necessary replenish their store of electricity.

The submarine boats may thus take up advanced positions at the entrance to the enemy's ports and may at times even attempt attacks in these ports or roadsteads themselves.

The success of such offensive use of the submarine boats must, however, largely depend on the strategical situation. Thus the submarine boats of a blockading fleet have the advantage that they run no danger till they approach the port of the enemy. When on their blockading station, they may, whenever found necessary, fall back on the advanced torpedo vessels and scouts, from which they may obtain fresh crews and supplies, or, if the weather is too rough, they may be towed into shelter.

It is clear that such service will be very exhausting for the personnel, but, even if not kept up continuously, such submarine blockade will have good chances of inflicting actual damage on the enemy, and cannot fail to produce a great moral effect. The weaker power, if blockaded, may indeed likewise send submarine boats to the enemy's ports, but the risk of discovery before they reach such ports will be much greater, and relief and assistance cannot so easily be obtained. Hence the endurance of the boats will be very limited, and the service will be intermittent and extremely hazardous.

On the other hand, submarine boats will be of great value to the blockaded part in the defence of home coasts and ports. The blockading vessels will be exposed to unexpected attacks by such craft, and may be forced to keep at a greater distance from the blockaded port than formerly.

Already in the Russo-Japanese War, where submarine boats were not used, the gros of the blockading fleet was ordinarily stationed in a well-protected advanced base, where it was safe from the attack of torpedo-boats. It did not, as in old days, cruise about in front of the enemy's port, but came out, in fact, only when called upon to meet the enemy's battleships, or to protect landing expeditions. The immediate blockade or watch was carried out by means of torpedo vessels and a few cruisers.

After the advent of the submarine boat this mode of warfare, the so-called "base strategy," which has been much facilitated by the development of the wireless telegraphy, will, no doubt, be followed even more rigorously. The harbor where the main fleet is stationed must, in future, be guarded and protected by special means against all forms of submarine attack; the fleet will not go out unless its action is urgently needed, and great precautions will be taken when going in and out of port. The blockading capital ships will hardly ever go as near the enemy's naval ports as did the Japanese battleships, with such fatal results, when they were used

for a close blockade of Port Arthur in order to protect the landing of the II Army.

II. STRATEGICAL CONDITIONS DURING THE WAR.

1. *England and Germany at War, Neither Being Supported by Other Powers.*

We shall commence by considering *the time up to the end of 1914*. After that year the Kaiser Wilhelm-Canal, as well as the new naval station at Brunsbüttel, will probably be completed. The harbor of Helgoland and the dock at Rosyth will be ready. Moreover, we know fairly definitely what the additions to the two navies of capital ships will be up to that time, while later development is impossible to predict. The great importance of the completion of the canal makes indeed the year 1914 or 1915 a turning point in the strategical relations of the two countries.

We have seen that the naval superiority of England as compared with Germany may at the present time be taken as three to one, steadily decreasing till at the end of 1914, when it is as about two to one, the superiority in " Dreadnoughts " being then as three to two. In view of this enormous difference in quantitative strength, we conclude that the war would essentially take the form of a blockade or masking of the German ports by the English. The object of the blockade would be:

1. To watch and report upon the movements of the German fleet, and to bring it to action.
2. To prevent the escape of commerce destroyers.
3. To prevent all trade on the German ports.

It would not be the immediate object of the blockade to prevent sorties of the German fleet, but only to secure and transmit such information about its movements as will enable the English main fleet to intercept it and to meet it with a superior force.

Let us consider first conditions in the *North Sea*. The English will undoubtedly keep their main fleet assembled at one base, whether in the northern or the southern part of the North Sea, if necessary, distributed in several ports or roadsteads so close together that an actual concentration can always be effected before meeting the enemy.

The first immediate duty of the English fleet will, according to the foregoing, be a close watch, and a blockade of the Helgoland Bay and of the Skagerak. This we imagine to be carried

out in the following way: Submarine boats are sent into th Helgoland Bay and stationed at the estuaries of the rivers. At tempts will be made to obstruct the channels by mines, and t block the harbor of Helgoland.

Destroyers keep going outside the bay and off Borkum, read to report any movements of German warships, and ready t intercept merchant vessels, which might attempt to break th blockade. The line to be watched, extending from Amrum t Borkum, is of about 90 miles length, but destroyers would prob ably take up more advanced positions. Similarly, destroyers, wit base on the Scotch or northern English coast, will watch th Skagerak.

Behind these lookout vessels are found scouts and other ligh cruisers distributed so as to form support for the destroyers an connecting links with the battle fleet. Armored cruisers are dis tributed in accordance with their speed and fighting powe partly as direct support for the lighter ships, partly as reserves i the rear.

The detailed distribution of the blockading vessels, as well a their tactical formation, shall not be discussed here, these feature being considered outside the scope of this essay, but it may b taken for granted that the whole North Sea would be kept unde surveillance.

The battle fleet remains at its base, as effectively protecte against submarine attack as possible, but ready to go out on sho notice, whenever German sorties in force are reported.

It is not likely that the efficient and enthusiastic German Nav would remain passive when subject to such a blockade.

From *the Helgoland Bay* cruisers and torpedo-boats would tr to escape and would attack the blockading vessels and perhap the shipping in the North Sea.

Cruisers attempting to reach the ocean would, as explaine above, in most cases be intercepted.

Submarine boats might break through the blockading lines a any time, but would in the open sea have poor chances of suc cess against the English ships, which would always be movin at a safe speed. Expeditions to the English coast must be carrie out chiefly in surface condition, across a sea closely watched b the enemy, and would, as explained above, be very liable t failure. Probably the most advanced blockading vessels an boats would suffer most from the attack of submarines.

As to the main fleet, it seems unlikely that the Germans should risk a decisive action in view of the overwhelming superiority of the English. Most likely the Germans would try to wear out the enemy by frequent sorties, undertaken with the object of surprising and overwhelming detached vessels or smaller squadrons. The time and radius of operation of the German ships must, however, always be limited as long as they want to avoid the English battle fleet. Attacks on English ports or landing expeditions on the English coast appear to be entirely out of the question under these circumstances.

Since the nearest point of the English coast is more than 200 miles from the blockading line the need of *an advanced base*, for repair and for replenishing bunkers and stores, would undoubtedly be strongly felt by the English. Especially the destroyers and the submarine boats would need an advanced point of refuge.

The best point for this purpose would be the island of Helgoland, but this island could hardly be reduced and captured without undue sacrifices. The German North Sea islands, even if they offer any suitable harbor, would be very difficult to hold, and points on the mainland are for the same reason entirely out of the question.

Outside the German coast we find to the north an excellent point of refuge in the Danish port of Esbjerg, close to the German frontier, but here again the English would soon be driven out by the Germans if the Danes prove incapable of preventing a landing. Similarly, points in Holland, even on the Frisian Islands, would probably be difficult to keep. In either case there would be an infringement of the neutrality of one of these countries with the attendant political complications, being a positive violation of the agreements of the North Sea Conference in Berlin, 1908.

It is therefore likely that England will accept the drawbacks accompanying the great distance between the blockading lines and their bases. These drawbacks are in fact not so great now as only a few years ago on account of the general increase in size of all classes of vessels, including destroyers and submarine boats, and on account of the advent of wireless telegraphy, but, with an enemy so energetic and well equipped as in the present case, it seems likely that the blockading service will be very strenuous and connected with considerable losses.

Let us next consider conditions in *the Baltic and in the Danish*

waters. If the English limit themselves to a blockade of the Skagerak, *i. e.*, if they do not penetrate into the Kattegat, they must be prepared to see German ships and torpedo-boats break through quite frequently. Cruisers, armored and unarmored, would have good chances of reaching the ocean and might thus threaten the English trade routes, although it must be admitted that in these days of wireless telegraphy such ships, having no base outside Germany on which to fall back, would be in a very perilous position. The English vessels and torpedo-boats, patrolling the North Sea, would be liable to continuous attacks, and since they would probably be somewhat scattered, while the German ships might perform concentrated offensive thrusts, the result of such engagements might often be fatal to the English.

Again, in this case, it would be highly desirable for the English to possess an advanced base. A port in Norway, near Lindesnæs, such as Kristiansand, would for this purpose be ideal, but could not be obtained without breaking the guaranteed neutrality of this country. The seizure of a port in Norway by the English would, moreover, probably be followed by the seizure of ports in Jutland, such as Skagen and Frederikshavn, by the Germans.

If we suppose the German "Dreadnoughts" to be stationed in Wilhelmshaven, a concentration of the German fleet in the Baltic could not be effected, and only the earlier battleships could make sorties through the Skagerak.

On the whole, then, we may expect the English to remain in control of the North Sea, but the frequent raids of German cruisers into the ocean, and the constant disturbances by sorties of German armored and unarmored ships into the North Sea would soon become intolerable to the English, and make it desirable for them to carry out a more effective blockade than is possible in the Skagerak. This could only be done by pushing the blockading lines farther forward, into the Kattegat or even through the Belt and the Sound into the Baltic. The Germans would, however, here, as pointed out above, be in a more advantageous position than the English, because they would be so much nearer to their base. Notably the German submarines would act under much more favorable conditions than the English, and also mines could be used with great effect. Hence the English could send armored ships into these waters only at the greatest risk, while detached cruisers and torpedo vessels would run great danger of being cut off or overwhelmed.

The only way in which England could overcome this difficulty and place herself on an equal footing with Germany in the Baltic, would be by establishing *an advanced naval base in the Danish waters.*

The best location of such a base would be on the eastern shores of the Great Belt, which channel, as stated above, is the highway between the Kattegat and the Baltic, and which, moreover, debouches on Kiel Bay. Another more retired base is found in the Danish capital, Copenhagen, on the Sound, which place, being fortified and provided with a good harbor and dockyard facilities, would form an excellent port of repair and supply for the fleet. Copenhagen would at the same time form a good base for a blockade of the eastern part of the German coast on the Baltic.

The possession of the former base implies indeed with necessity the possession of the latter, since no position on the shores of Zealand could be securely held against the will of the Danish government without control of the whole island and in particular of Copenhagen.

From these two bases the English might thus blockade Kielerhaven and the entire German sea-coast on the Baltic, and they could not be driven away from Zealand as long as they were in control of the surrounding waters.

In pushing through the Kattegat and the Great Belt the English would probably meet with a determined resistance from the German fleet, which could consist, however, of only Pre-Dreadnoughts, since the Canal cannot be passed by Dreadnoughts. To meet such a force the English might detach a superior squadron of similar ships, without unduly weakening their main fleet in the North Sea.

Even after the German battleships and cruisers were driven back on Kiel, there would still remain a danger of losses from the attack of submarine boats and mines. To this must be added the resistance which the English fleet would meet from Denmark, the moment it tries to seize upon a base in strictly Danish waters. In order to gauge this resistance, we must consider the probable political attitude of Denmark and the condition of its national defence.

It is the declared policy of Denmark to remain neutral under all conditions, and there is every reason to believe that Denmark would oppose with armed force, to the utmost of its ability, any infringement of its neutrality, whoever might be the aggressor.

The problem of the defence is in Denmark one of peculiar difficulty, because the territory is by the Great Belt divided into two parts, each of which has to be defended separately, if the navy is not in control of this channel.

The defence of the western portion, Jutland and Fyen, is necessarily weak, since the army must be mainly concentrated on Zealand as the most important part of the country, and since there are no fortified positions in the western part of the kingdom on which the army can fall back. In fact, if the aggressor is Germany, the resistance which can be offered will be relatively insignificant. If England is the aggressor, the case is somewhat better for the Danish forces, since the English Army must then effect a landing, which is always a somewhat delicate operation. Should such a landing be attempted, and should the Danish forces prove incapable of preventing it, it is likely that the Germans would step in. In view of the overwhelming superiority of the German Army it is indeed very unlikely that the English should attempt a landing in Jutland, as long as the German forces are not engaged elsewhere.

The eastern portion of the kingdom, Zealand, with adjacent islands, comprising the capital, is placed under entirely different strategic conditions, since it is capable of a naval defence. As the Danish waters are particularly well adapted to the use of mines and torpedo vessels of all kinds, this defence may be made very effective. The first and most important line of defence is therefore formed by the navy.

The Danish Navy consists at present of four small armorclads, a number of torpedo-boats, mostly of older date and one small submarine, suitable only for harbor defence. The mine defence is fairly well developed.

The armorclads, although incapable of fighting first-class battleships and of resisting submarine attack, will be useful against hostile cruisers and torpedo vessels and as support for own torpedo-boats and submarines.

According to the bill of national defence of 1909 there are to be 24 torpedo-boats and submarines, and several such boats, among which two submarines, are now under construction.

The only base of the navy is Copenhagen, which place, according to the new bill of defence, will soon be fairly well protected on the sea front. Thus the main force of the fleet will be free to take up an advanced position on the Great Belt for defending the

neutrality of this channel, and for maintaining the connection between Fyen and Zealand.

The position most suitable for this purpose is a bay between the islands Zealand and Laaland, called *the Smaaland Sea,* which is now being provided with fortifications at various points. The Smaaland Sea is undoubtedly the best position for controlling the Belt, and it is of particular importance that the Danish naval force should entrench itself here, because it is at the same time the position most likely to be coveted as an advanced base by a power, which, like England, might desire to blockade Kielerhaven.

The second line of defence is the coast of Zealand, where the navy and the field army may cooperate in opposing landing expeditions of an enemy. Since the Danish ships and torpedo-boats are easily overwhelmed by a great naval power, submarine boats would here be of particular value, but, as appears from the foregoing statements, Denmark is at present very poor in this class of vessel. The mine defence is alone likely to cause any serious difficulty to the enemy.

The total strength of the Danish Army is about 80,000 men when fully mobilized, with a field artillery of 96 guns of modern type, but a part of this force may be stationed in Jutland and Fyen, while another part will be tied to the defence of Copenhagen.

The third line of defence consists in the fortifications round Copenhagen. Copenhagen cannot be considered a fortress as far as the defence towards the land front is concerned; in fact the place has here more the character of an intrenched camp or fortified position on which the field army can fall back.

The resistance which can be offered by the second and third lines of defence is, from the point of view of a great power, only small, and can be estimated with tolerable certainty beforehand, but the resistance which may be offered by the first line, the navy, if properly developed, is of an entirely different order.

We need consider only the fate of the battleships *Petropawlowsk*, *Hatsuse* and *Yashima* to realize the risks incurred by vessels operating in hostile waters suitable for mine laying, as are the Danish waters in an eminent degree. The advent of the submarine boat has greatly added to these risks.

All that is needed in order to make the naval defence of Zealand a serious obstacle even to a great power is a further development of the mine defence and the acquisition of a number of submarine boats.

We shall now return to the discussion of an English occupation of an advanced naval base on the Great Belt and of Copenhagen. We assume then, that as the first step in this operation the English have succeeded in driving back the Baltic division of the German fleet into Kielerhaven, and that they have seized upon the Smaaland Sea, overcoming the resistance which they would here meet from the Danish Navy. If this base is to be held in safety, we have seen that it will be necessary for the English to take possession of Zealand and of Copenhagen. The existence of the Danish field army will force the English to land a very considerable expeditionary force, which will require a large tonnage for its transportation.

As explained above, the resistance which the Danish Navy can offer at present to the landing of such an expedition will not be serious.

German submarines will perhaps constitute the gravest menace to an English landing expedition, but these boats, having no base in Danish waters, will not be in so favorable a position as would be Danish submarines stationed at the various Danish harbors and fjords.

Points on the coast of Zealand can be found where the landing of troops can take place under the guns of the ships in perfect safety against the attack of the Danish Army. A force, superior to any which the Danes can put in the field, can be landed, and the Danish Army can be driven back on Copenhagen. After further reinforcements and siege guns have arrived, the fall of this city will only be a question of time.

Although the operation must be admitted to present very serious risks and difficulties, it seems perfectly feasible under the present circumstances, and would perhaps be carried out by a coup-de-main at the beginning of the war.

If then the English succeed in establishing themselves on Zealand they will be absolute masters in the North Sea and the Baltic and will be able to carry on an effective blockade of the entire German coast.

The occupation of Zealand by England would probably be followed by an occupation by Germany of Jutland and Fyen as a countermove. The Germans would hereby obtain control of the western shores of the Great Belt and the Kattegat and might thus, under many circumstances, be able to disturb the English line of communication. It is not unlikely that in such case the English

would contest the German occupation of Fyen, which might thus become the scene of serious fighting.

An occupation of Zealand by Germany, anticipating the action of England, would hardly be attempted as long as the Germans have no assured control of the Danish waters, and if such control were established, the occupation would have no object.

We shall next consider the case where *the war takes place during or after* 1915, when the works on the Kaiser Wilhelm-Canal will have been completed. Let us suppose that the increase in capital ships of the two navies after 1914 is as indicated on Plate I. The situation during the years 1915-20, will then be gradually improving for Germany, for at the end of that period her strength in "Dreadnoughts" will be about as three to five, while the preponderance in "Pre-Dreadnoughts," which England possesses at present, will be reduced and will lose more and more in significance (see Table and Plate II).

Germany will now be able to concentrate her entire fleet in either the North Sea or the Baltic as desired, and it will not be safe or wise for England to attempt the seizure of a base in Danish waters, since this would necessitate the division of her fleet into halves, which could not on short notice mutually support each other. Such a move could indeed not be contemplated by England, unless the German main fleet had been first defeated. England must therefore, as far as the Baltic is concerned, limit herself to a blockade of the Skagerak, and will be in the position already described above, where her trade is liable to suffer serious disturbances, and where she will have to face frequent offensive blows from the German Navy. The Germans would in this case, as mentioned before, need a base in the northern part of Jutland, just as the English would need a base in Norway, but the resistance which these small countries are able to offer to such violation of their neutrality, would no doubt first be seriously considered.

In actions between the main fleets the English have a reasonable prospect of defeating the Germans, although hardly without suffering serious losses themselves. Where the difference in strength is not greater than here assumed towards the year 1920, it is not safe, however, to rely too much upon numerical comparisons, even if full allowance is given for the high standing of the British Navy. Unless the war is brought to an early end by pressure from other powers or by internal or colonial difficulties, it is

quite likely to be of long duration. In a protracted war the resources of the two countries for the construction of ships, guns, armor and other war material would play a most important part and would no doubt be strained to the utmost. The rate of construction of Dreadnoughts in peace time has been estimated to be eleven for England and eight for Germany per two years. The final issue might thus come to depend on which country would first become economically exhausted.

Even if the English fleet were defeated, there would, however, be no probability of a German invasion into England. Such an operation would require an assured control of the North Sea, which Germany could not expect to obtain, especially in these days of submarine boats. If a landing should be attempted and successfully accomplished, the line of communication would be liable to interruption, and it is believed, that in view of the strength of the English Army as well as the resolution and resourcefulness of the English nation, the life of such an expedition would be very short.

Before attempting to form any general conclusion, it is necessary to complete the mental sketch which has here been drawn by considering briefly *the trade and food supply* of the two countries during the war.

According to the so-called "Declaration of London," adopted by the International Naval Conference, held in London, 1908-09, *all goods, excepting absolute contraband of war, destined to one of the belligerents, are exempt from capture by an enemy if carried in neutral bottoms and documented for discharge in neutral ports.* This rule includes not only raw materials and manufactured articles which are susceptible of use for peace purposes only, but also so-called *conditional contraband of war, i. e.*, articles susceptible of use in war as well as for purposes of peace. Foodstuffs, fuel, etc., belong to this category. Such *conditional contraband carried by a neutral ship is, on the other hand, under many circumstances, liable to capture when documented for discharge in enemy port.*

It is easy to show that in a war between Germany and England these rules are as favorable to Germany as they are unfavorable to England, on account of the peculiar geographical conditions of these two countries.

Holland, Belgium and Denmark form the chief gateways through which, under this rule, raw materials and foodstuffs

carried in neutral or even English bottoms may flow into Germany, and through which German manufactured goods may be exported to all parts of the world. Holland, in particular, is favorably situated for such trade, having excellent connection by waterway right into the heart of Germany.

England, on the other hand, is not contiguous to any neutral country, and according to Article 34 of the Declaration neutral ships carrying conditional contraband of war to English ports will be liable to capture by German warships in the following cases:

1. If consigned directly to any department of the British Government.

2. If consigned to a trader, who is known to have delivered goods of the kind in question to the British Government.

3. If consigned to any British fortified place.

4. If consigned to any place which serves as a base of operation or supply for the British Army or Navy.

It is seen that this article is so vague as to permit of a very broad definition. Thus practically any port of importance in the United Kingdom, and indeed in the British Empire, may, according to (3) and (4), be interpreted to fall under this rule.

Moreover, according to Article 49, neutral vessels are, when thus captured, liable, in "exceptional" cases, to be destroyed, viz., when the warship cannot bring it into port without involving danger to itself. This contingency, which in the case of German warships is likely to be the rule rather than the exception, will, of course, greatly increase the insurance premium in such trade.

It follows, for instance, that a neutral ship carrying wheat, which is on the way to Germany via Rotterdam, cannot be captured by English warships, even if the wheat is destined to the German Army or Navy, while the same ship, carrying wheat to England, will, in most cases, be liable to capture or even destruction by German warships.

Thus Germany may obtain food supplies not only by land but also by sea with perfect security, while the supply of foodstuffs to England, which to this country is an absolute necessity, will be liable to serious interruption, if any German cruisers are abroad.

It is in this connection of great interest to note that at the London Conference the British government proposed certain re-

strictions in *the rights of belligerents to convert merchant vessels into warships on the high seas,* but the delegates of the other powers refused to attach any condition or limitation to this principle. Thus, at the outbreak of the war, Germany may convert a number of her merchant ships into auxiliary cruisers, if before the war she has provided them with arms and ammunition. Such conversion may, of course, also take place later during the war.

England has not, at the time these lines are written, ratified the rules of this Conference. Since the main object of the Conference was to frame rules for the guidance of a new international prize court, and since agreement was not obtained on all the questions raised by the British government, the basis for the establishment of such a court is not complete. Since, moreever, the rules agreed upon have met with bitter opposition from several sides in England, it does not seem certain that this ratification will take place.

We have seen that *if England succeeds in establishing herself on Zealand,* she is able to carry out a complete and effective blockade of all German ports, naval and commercial. Hence German shipping will be in that case completely paralyzed from the beginning of the war. All over the world German merchant vessels will be laid up, inactive as during a great strike. The German colonies may be occupied by England, and German shipping will be largely supplanted by English.

If England accedes to the rules of the London Conference, the industry and commerce of Germany will, however, largely go on as in time of peace, and the food supply will not be seriously disturbed. German merchant ships converted into auxiliary cruisers will at once from the beginning of the war prey upon English shipping, and German cruisers breaking the blockade may from time to time cause disturbances in English trade, but it seems likely that all such vessels, being without any base, would soon be hunted down or driven into port by the English cruisers. Thus on the whole the shipping and food supply, the trade and the industry of England would, under these circumstances, hardly suffer any serious disturbance. The interruption in mutual trade relations which the two warring countries would suffer would of course in any case cause great losses to both nations.

If, on the other hand, *the English have no advanced base in the Baltic,* as is likely to be the case if the war takes place after the work on the Kaiser Wilhelm-Canal is completed, we have seen

that German cruisers will probably break the blockade in Skagerak quite frequently. In such case English shipping, trade and food supply may be seriously disturbed. Prices on foodstuffs may rise sharply and panics may be caused. At the same time the German trade in the Baltic and in Danish waters may be carried on as in time of peace, and the great Danish export of foodstuffs, which ordinarily goes to England, will be diverted into Germany.

On the whole, if England adheres to the rules of the London Conference, the economic life of Germany will not be deeply affected in either case. If, on the other hand, England does not ratify these rules, she may, if she chooses, consider as absolute contraband all the articles specified by the Conference as conditional contraband, and by giving a broad definition to the list of articles so specified, she may most seriously hamper the food supply, as well as the trade and industry of Germany. In this case not only the shipping, but also the trade and industry of England will flourish at the expense of those of Germany.

2. *England allied with France at War with Germany.*

Referring to the foregoing discussion, the naval situation on the North Sea and the Baltic will in this case only be changed in as much as the inferiority of the German Navy will now be more marked. The probability of an occupation of Zealand will therefore be greater than if England stood alone against Germany.

By establishing themselves on Zealand the Allies would not only be able to blockade Kiel and the German coast on the Baltic, but would also pave the way for a diversion from the north, should such a move be found opportune. The mere possibility of such a diversion would tie a part of the German Army in the defence of Kielerhaven and would force Germany to undertake a strong occupation of Jutland and Fyen.

The main issue of the war would be determined on the continent, and would depend chiefly on the strength of the expeditionary force, which England could send to the support of France.

Should the Germans be victorious, they might take possession of the French Channel ports, but as long as the Allies were in control of the sea, Germany would be as incapable of invading England as was Napoleon in 1805.

3. *A Great European War.*

We shall only consider the case where the powers of the Triple Entente, England, France and Russia, are at war with the two powers of the Dreibund, Germany, Austria, while Italy may or may not be supposed to take part in the war.

While the French Navy may be partly or wholly engaged in the Mediterranean, the Russian Baltic fleet will be available. The balance of naval power in the North Sea and the Baltic will be strongly in favor of England and her Allies, and it is again extremely likely that these powers will attempt to seize Zealand so as to be able to control the Great Belt and to blockade Kiel effectively.

Again in this case the issue of the war would be determined on shore.

SUMMARY AND CONCLUSIONS.

It has been shown that in the event of the war taking place before 1915, Germany will be at a great disadvantage in a single-handed conflict with England. Her colonies will be occupied, her entire coast line will be blockaded, and her shipping paralyzed. If England does not tie herself by a ratification of the rules of the London Conference, the trade, the industry, and the food supply of Germany are liable to suffer most serious interruption, while the commerce and industry of England will prosper almost in the same measure as those of Germany decline. Thus England may exert a great economic pressure on Germany, and this latter country will be practically unable to retaliate. On the other hand, England is incapable of directly inflicting any vital injury upon Germany, for the perfect coast defence of this country and the great military power behind it render it safe against all shore attack. The English will probably attempt to establish a base on Zealand, in which case the Germans are likely to occupy Jutland and, perhaps, Fyen.

The outcome will depend on how long Germany will be able to sustain this throttling of her economic life.

In the event of England adhering to the rules of the London Conference, Germany will probably be capable of a more prolonged resistance. Political conditions and events, internal or external, may of course force the warring nations to an early peace, but otherwise Germany may gain time for a material increase in

naval strength by new construction, as well as for the completion of the Canal. The English will then be liable to be driven out of the Baltic and the Danish waters, Zealand will be captured by the Germans, and the war will enter into a different phase.

After the completion of the Kaiser Wilhelm-Canal, Germany will be in a much better strategical position. Provided the growth of the two navies is as assumed in the foregoing and as indicated in Plates I and II, the relative strength of Germany will be gradually improving till the time when her naval program is completed.

Towards the end of the period 1915-20 the disparity in strength will not in fact be so very great, and it seems quite possible that the war may be carried on with varying success. Moreover, many other factors, besides numerical strength and success in battle, may influence the final outcome of the war. Even if England is victorious and even if she has fully maintained her present naval superiority, it seems certain that her trade and food supply will suffer interruption and that she will experience heavy losses. It is likely that the war will be carried to the point of exhaustion of one of the parties, both countries putting forth their utmost efforts in military operations as well as in repair and renewal of their matériel.

An exclusively naval war must rely for its issue ultimately on economical exhaustion, and is likely, under the circumstances here discussed, to be either inconclusive or else very protracted. The warring nations can in fact only apply a part of their resources and forces in the conflict, since their armies cannot be brought into action, and the most powerful form of coercion, that of territorial occupation following the defeat of the hostile army, cannot be employed.

In the event of fighting between the two powers taking place on shore, whether on Zealand, Fyen or elsewhere, the war may, of course, acquire a much more intense character.

On the whole, a war between England and Germany alone, in the near future, whether before or after 1915, cannot be tempting to either party, but it must be admitted that events may happen, not to be foreseen and entirely outside the control of the two countries, which at any time may produce a conflict. Hence, it is necessary for the countries concerned, including adjacent small countries, to be fully prepared for war.

Holland and Denmark, which flank the German North Sea coast, will act as buffer States to the German Empire, as long as they are neutral. Holland will, in particular, cause the stress of the commercial blockade of the North Sea coast to be relieved, while Denmark will prevent a close blockade of the Baltic coast line. Thus, during a war with England, Germany is interested in respecting the neutrality of these countries, on condition, however, that their policy is strictly and impartially neutral, and that they are capable themselves of defending their neutrality.

If these conditions are not fulfilled, we have seen that these countries, and in particular Denmark, will constitute a danger to Germany, and their position will then be very critical.

It is therefore dangerous for these small countries to listen to the advice of the peace advocates, who recommend the easy and tempting course of disarmament. So long as the great powers have not disarmed, the small powers must be prepared to protect their neutrality and independence with armed force.

Denmark is indeed at present making great efforts for strengthening her national defence, but an addition of a considerable number of submarine boats should be made to the existing programme of the navy.

Unless Denmark is well prepared to defend her neutrality, in particular on the sea, she will run great risks of seeing her territory invaded by the belligerents in spite of the most earnest and impartial policy of neutrality on her part. Denmark will then become a second Manchuria, a battleground for foreign armies and navies, and even the integrity and independence of the country may be jeopardized.

Holland is militarily much stronger and, as appears from the foregoing, not in quite so dangerous a position as Denmark.

As to the probability of France or other powers taking part in the conflict, and as to the probable outcome of the war in such case, no opinion shall here be expressed. The strategic conditions in the North Sea and the Baltic would, however, probably be essentially of the same order as during a war between England and Germany alone.

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COMPETITION *VS.* CHARACTER.

By Lieut.-Commander Lyman A. Cotten, U. S. Navy.

Of recent years, in our navy, competition has become the power of powers. It is no new thing, as we shall see, but it has been put to new uses, and has grown and spread until it permeates the naval atmosphere and largely dominates naval thought. Many look upon competition almost as a sacred institution: the open sesame to all achievement and success, without which every desirable naval quality would languish and die. To these the mere questioning of the value of competition will seem as nothing less than high treason. When a thing gets to be too sacred for criticism, it is very safe to presume that it is sadly in need of it. If criticism be well merited, then it must surely serve a useful purpose; if it be without merit, it falls away from its subject, leaving it all the brighter in the clarified atmosphere.

The following is not an indictment against competition of itself, but a few simple reasons are herein gathered together, to show the fallacies of competition run riot, and to point out some of the attendant dangers of uncurbed competition, that at times degenerates into a veritable orgy of competition. It is a plea for safe and sane competition under control and restraint, and at the same time a plea for some of those immensurable things that go to make up the ideal leader, and are believed to be unfavorably affected by competition as it now exists in our service. Also what follows is believed to fairly represent the ideas of a large and rapidly increasing number of officers, and therefore entitled at least to careful consideration.

Let us first briefly look into the condition that led to the adaptation of competition as the great healer of our modern navy. Forty years of unbroken peace prior to the Spanish-American War had seen our navy reduced, at one time, almost to a con-

dition of inutility, and certainly to a condition of woeful inadequacy. True, such duties as came in peace were well done, but the insidious teachings of peace led to false standards and erroneous conceptions. Preparedness for war, the sole justification for the existence of a navy, was lost sight of in the pleasanter pursuits of peace. Our navy became essentially a show navy, and our ships were scattered in small and heterogeneous groups to the four corners of the earth. Showing the flag became the acknowledged function of our ships, and the appearance of a ship was the generally accepted measure of her efficiency. A long unbroken state of peace, with no actual prospect of war, usually plays havoc with the rugged military virtues, and warps the good judgment necessary to the proper perspective of professional matters. It is feared that during this long period of peace our service often worshipped false gods, and judged itself by artificial standards. The requirements of *peace* were well met, and complacency and self-satisfaction grew and thrived.

The war with Spain but tended in a large part to confirm self-satisfaction, for its results were surely of a satisfactory nature from a naval standpoint, though it must be confessed that we were blessed with an enemy only more steeped in the false standards of peace than we were.

After the Spanish-American War, our government took a step unprecedented in our national history. It had been a time-honored custom of our country, at the conclusion of each war in which it had been engaged, to reduce and curtail the navy and army, the weapons by which the war had been brought to a more or less successful termination, until they remained but skeletons of what they had been. After the war with Spain, however, both branches of our military force were largely increased, due no doubt to our increased responsibilities through having become a colonial power, and to the insurrection in the Philippines.

Now it was that certain ones, in the service, of keener perception or more analytical turn of mind, began to sound a note of warning that soon was heard throughout the navy. Here a weakness was pointed out, there a conceit was punctured, and louder and more insistent became the cry of warning, that would not down however much it were flouted. Gradually the truth dawned that the war efficiency of our navy was at low ebb and through indifference and self-satisfaction tending to get lower.

Then came the search with zeal and energy for the remedy, and all honor must be given to those that brought forward as the revivifier, competition, for whatever else may be said of it, it did arouse interest and remove lassitude. It is charged in China that frequently, during a particularly healthful season in a city, the coffin guild will have rats infected with bubonic plague introduced to *stimulate their business.* Unquestionably it accomplishes its object, though doubtless rather depressing in other ways. Has competition proved an unmixed blessing to our service, or has it introduced an infection with it? That is what we wish to look into.

When a doctor finds a patient weak and low in vitality he often prescribes a violent stimulant. Our patient, the navy, was most noticeably weak in that prime essential of war efficiency, gunnery, and the "gun-doctors" prescribed a violent stimulant, competition.

Almost immediately the patient began to show signs of renewed vigor. Lassitude was replaced by interest and improvement crowded upon the heels of intelligent endeavor. It has ever been the desire of a great many of those belonging to the profession of arms to find some cure-all for the weaknesses to which their profession is prone; some sure and certain nostrum to insure success in war. Seeing the first invigorating effect of the application of competition to gunnery, a large number of officers straightway seized upon competition as the long-sought nostrum and henceforth it became the guiding genius of our navy, and the spirit of competition was disseminated through its every branch.

Let us see what this great cure-all is that we term competition, and that seems of recent years to have become woven into such an integral part of the fabric of our naval being. Whence came it and what is its history? Are its associations and influences good, bad or indifferent? These, and other things, it behooves us to look into well and earnestly, for surely competition has become a power. As we understand the term, competition may be defined as "a striving to win," and the degree of success is measured not in actual accomplishment, but in relative standing of all competitors. Thus by gradation an attempt is made to determine the relative efficiency of all the competitors in the subject in competition, whereas what is really determined is the relative

degrees of success of the different competitors in the *elements entering into the competition.* For example, at our Naval Academy, the midshipmen of a class throughout the course are in competition, each with the other. The academic board awards a weight to mathematics, another weight to ordnance, to practical navigation, and so on through all the different branches. The total of each midshipman represents his standing in his class, but *not* necessarily his efficiency as an officer. It is perfectly well recognized that a good officer is about as likely to come from the foot of a class as from its head, for many of the intangible attributes that go to make up the good officer cannot be graded in competition. We are developing the material elements in competition, but at the expense of more important elements not in competition. We are letting competition run riot and retarding the development of character—that moral force without which wars cannot be won, however perfect the war material may be.

Competition is nothing new, for records of its many forms have come down to us from earliest times. It is not necessary, however, to search ancient history to learn the effect of competition on character. In our colleges and universities of the present day competition has been developed to a degree probably never exceeded. In its relation to college students we may learn something of its effects, and also the opinions of many learned men as to what they consider its effects to have been.

Until comparatively recent years it was the custom of most of our colleges to grade their students according to proficiency in each study. In other words, each study became a competition, just as at present it is at the Naval Academy, and each student taking that study became a competitor for the prize of leading his class in relative standing. Now such gradation of students has generally ceased. A student may be graded "excellent" or "good" or "bad" in a study, but how excellent or good or bad is left undetermined. This change came about after the most mature and intimate thought and discussion by college authorities, because it was believed that the fierce competition engendered by the old system injuriously affected the development of character. The degree of excellence in a study was not in itself so much the object sought as the character built up through study. The intense rivalry due to competition often led to cheating, excessive and injurious "cramming" and various forms of unfair

and unworthy practices, and generally tended to lower the moral tone.

In college athletics we find very similar results. The desire to win in competition with teams representing other colleges quite submerged the real object of the game, and led to misrepresentation, deception, extravagance, roughness and brutality. Some colleges have absolutely prohibited intercollegiate contests, and all have hedged these contests about with many corrective rules.

It must be acknowledged that in colleges, at least, competition has not proved itself an unmixed blessing, and from analogy we might expect somewhat similar results in our service. In the first place, competition is no new thing in our navy. How long it has existed therein is not known, but certainly it reached a keen pitch among the sailing ships in the years subsequent to our civil war. Light yards and topgallant masts came down on the run, and "gil-guys" of almost human intelligence were developed. Some ships became so expert in competition that it was dangerous to touch anything without warning when the actual necessity arose.

So, after all, competition was no new thing discovered after the Spanish-American War. It was only rediscovered, and through rules made applicable to modern conditions, and put upon an official basis. It has always been recognized that competition to stimulate interest must be governed by such rules, and held under such conditions, as not to favor any participant at the expense of another. So, at this time, more or less elaborate rules governing *conditions* and *procedure* in competition were promulgated.

The sea is proverbially an uncertain element, and in order that competition may be fair, various forms of artificiality have to be introduced into the competitions, and sanctioned officially, for now our competitions differ from those of sailing-ship days in that they are official. Having introduced artificial conditions into the competitions, false deductions are drawn therefrom, false ideas of training encouraged and real preparation for real conditions thereby injuriously affected.

From the beginning of official competition the opinion has been generally held that anything not actually prohibited by the rules was permissible, thus, while holding to the letter of rules, in many cases violating their spirit. This, from time to time, led to elabo-

ration of rules, until the very rules themselves in some cases became a study of no mean proportions. Mere complication of rules in itself is of minor importance, but it tends to show the complexity of artificial conditions and the extent to which regulation has had to go. Every contingency that may arise has its corresponding rule, while umpires and observers check and cross-check each phase and each feature. No officer or man is longer expected or required to make correct report, except in so far as it is required by his checkers, for no unchecked report is taken into consideration. If this be necessary, then is the laborer not worthy of his hire, and character development is needed above all else.

The general effect of a stimulant is well known. If a reaction of constant intensity is desired, larger and larger quantities of the stimulant have to be administered, until, finally, it not only loses its power to stimulate, but actually depresses. Competition is unquestionably a stimulant, and avowedly so administered to our service, but it is feared that we are actually trying to keep our quondam patient alive by this stimulant. Louder and more insistent grows the cry for more and still more competition, and more and more neglected are the non-competitive features that enter into naval efficiency, until their very importance is forgotten and their utility denied. So fierce becomes the competition that frequently the *object* of the competition is lost sight of in the competition itself, thus making it the end rather than the means to an end. Competition develops the desire to win rather than the desire to excel, and with the desire to win at all hazards is also developed a tendency to trickery, imposition and subterfuge. It is not meant that this is general in our service, but the direction of the wind may be learned from the way the spray flies.

Official competition was first introduced into the service, as has been stated, in connection with gunnery, and in that branch it has reached its most violent development. Let us see how it works. As the time for target practice approaches, interest *in the competition* (not necessarily in gunnery) increases until all else is lost sight of in the one possessing idea of standing well. As our competition is conducted and emphasized, the desire to win is inordinately stimulated alike by the vanity of officers and the cupidity of men, until in many cases it becomes such a passion that erstwhile good judgment is so warped that prudence and discre-

tion are thrown to the winds. Small wonder that competition and accident have so frequently gone hand in hand.

As soon as the practice is over the artificially stimulated interest collapses like a punctured balloon, and the art of gunnery languishes until the approach of the next target practice. However, some of the *bad* results of too violent competition follow close upon the heels of target practice. Insinuations, jealousies, disputes and protests are belched forth *ad nauseam*. Some protest in relation to their own scores, and others, having exhausted every effort to pull themselves up, attempt, by protest, to pull some fellow competitor down. One ship protests because she had to fire too nearly in the direction that the sun bore; another because she had the wind from an unfavorable quarter; still another because her pointers were unadvantageously affected by being kept "standing by" for a few hours. Now these and many other protested conditions are but natural, and that they are looked upon as things to be avoided in practice only shows what artificiality obtains and is accepted as the standard. Of course, it is the duty of the tactician in actual battle to eliminate as far as may be within his power disadvantageous conditions, but surely the gunnery training should not preclude them, for they may be forced upon one by an adversary more highly skilled in the art of tactics, at which time good gunnery becomes all the more essential, since that alone may then serve to regain the lost advantage.

It is not alone the features that enter into competition that are affected by competition, for there is a decided reactionary effect upon the non-competitive features that go so far to make up real efficiency. The artificial stimulant competition, by directing an exorbitant amount of effort into competitive channels, withdraws it often from its natural and logical channel and retards development in the features not in competition.

It is very difficult to get every element that goes to make up war efficiency into competition, for many of them cannot be expressed in units of a standard, thus precluding exact gradation, the prime requisite of competition as at present applied in our service. This is particularly true of such elements as strategy, tactics and that fundamental upon which all war efficiency is so largely dependent, *moral force* or *character*. The material things may easily be arranged for competition. Thus the number of hits

per minute may be prescribed as the measure of gunnery efficiency; the coal and water and oil used, or the speed developed may be designated as the standard measurement of steam engineering efficiency; the money value of stores used may be taken as the measure of economical efficiency, but we can get no material standard by which we may measure degrees of proficiency in such intangible things as ability to command in its broadest sense, to lead or to inspire in subordinates that confidence so intimately associated with success in war. These things are largely based upon character or moral force, and this is not developed by our materialistic competitions, but is rather retarded by being apparently relegated to a place of lesser importance. In the wild scramble for success in competition our whole perspective becomes so warped that there is danger of our losing our ability to differentiate between essentials and non-essentials. The very roots of character formation are being contaminated by the virulent and noxious growths springing from competition.

The enlisted personnel of our service is in a constant state of change, and is replenished largely by young, impressionable and untrained men, and to a lesser degree the same is true of the commissioned personnel. These young men receive their most vivid impressions of the service through the competitions in which they take part. All stress is placed upon these competitions, *purely as competitions,* and everything else is relegated to the background of unimportance. Every appeal is made to vanity and cupidity, the twin foci of the ellipse of competition about which, as centers, so many of the evils of competition revolve. It is not surprising that one who does well in competition magnifies his own importance out of all proportion to the true case. He puffs himself up, much as does the star player upon some minor college team, until the very success of the team is held in his hand and subject to his every caprice. He holds himself to be superior to his fellows, and not subject to ordinary rules and regulations. The indispensable man should not be tolerated aboard ship, and a man, though qualified through competition, may thereby be *ruined* as a military asset.

That a gun pointer, for example, should do the best of which he is capable, regardless of competition, is not among the precepts taught to-day. That it is his duty to do his best, and he is ordered by his officers to do so, and it is right that he should do

so, and his responsibility demands that he do so, are, it is feared, unheard-of dicta to the present-day pointers, and but meaningless phrases to the young officers. Unquestioning obedience and staunch loyalty, the foundation stones of all true discipline, are being undermined to such an extent that, if it continues to go as of recent years, ere long officers and men will undertake aught not pertaining to some competition only when, where and as they see fit, or at least only at the very earnest solicitation of their responsible seniors. The performance of duty not relating to competition is often most perfunctory, and if perchance it should interfere (or be thought to interfere) with preparation for a competition, it is resented as being untimely, unfair and inopportune, however important in itself the duty may be. Competition is so emphasized that in the minds of many young officers and men nothing else is of any importance.

For more than 10 years now we have happily been blessed with peace, but we must beware of the false teachings and unsound standards of peace, now as ever. During our last long period of peace our standard in material things wandered far from the naval ideal, but through all this period of peace, ideals of duty, of character and moral force were clung to, and despite our weakness in many respects we passed safely through the trial of war. The pendulum is swinging the other way during this period of peace, and we are concentrating more upon material things, but let us not lose sight of the actual military value of character. Competition was officially introduced into the service shortly after the close of a war as an aid to the preparation for war, but it has been allowed, even encouraged, to run riot, and may by its very intensity have defeated its own object.

If the reasoning herein set forth is true, the remedy is apparent. Restrain and control competition. Make it serve as a means instead of an end. Do not sacrifice anything important to competition. Keep down artificiality. Do not attempt to grade all competitors with exactitude. If a ship be excellent in gunnery, or very good in steam engineering, it is quite enough that she know this, without attempting through some more or less artificial standard, to express to all just *how* excellent she is, or just *where* she comes among all those that are very good. Allow all the crew of an excellent ship to wear some badge of honor, as an E upon their sleeves or a colored cap ribbon, but do not attempt

to buy war efficiency with dollars and cents. If it be real it cannot be bought, and bogus efficiency but leads to a false sense of security. Above all else look to the development of character, for that is the great immensurable military quality that sustains in adversity, comforts in suffering, perseveres under discouragement, sacrifices self to duty, and will be in the future, as it has been in the past, ever associated with military success.

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EARLY DAYS IN JAPAN.

By Captain Arthur C. Hansard.

Japan is supposed to have been first visited by the Portuguese as early as 1542, and it would appear that they managed to establish a strong trade with the country: then in the beginning of the seventeenth century the Dutch established a trading station at Nagasaki. The East India Company, in 1613, also established a depôt on a small island named Hirado, off the west coast of Kiushiu, under a Captain Siris, but he abandoned the post in 1623. A shipwrecked English sailor named Will Adams, of Limehouse, London, lived for many years at Yedo in the service of the Shogun or Tycoon, mainly as a shipwright and boat builder, and he died there in 1620. The Portuguese might have remained indefinitely had they not meddled in politics; they also introduced a new religion which made such rapid progress that tradition put the number of converts down at several millions during the first hundred years. The early religious propagandists were men of noble character, but they were soon followed by men of inferior qualities and the people began to suspect that the real object of this mission work was the subjugation of the country. At first the Portuguese were persecuted, then they were expelled, and the sins of the Portuguese were visited on all foreigners indiscriminately, access to the country being denied to all aliens alike, except a few Dutch who were allowed to remain at Nagasaki for trade purposes, under very humiliating conditions. Japan thus closed her doors to the nations of the West, and they remained so closed for two centuries and a half, when Commodore Perry, of the United States Navy, landed at Uraga with a letter from the President of his country, and secured the promise of a treaty. Many vessels visited the islands during the interval and attempts had been made to secure a footing in the country. There was an edict

prohibiting natives from leaving the islands and this law was strictly enforced. In 1870 a sister of the writer brought away from Japan the first native woman who was ever allowed to leave the country. Many natives who had chanced to be carried off in ships by which they had been saved when shipwrecked in their own junks were not permitted to return until after the formal opening of the country to commerce in 1854. Many of these men, on their return, could not speak their native language, but as they soon picked it up they became of great service to the State, mostly as interpreters and in other capacities.

Prior to 1868 there may be said to have been two rulers in the country. The Ten-shi, or Mikado as he is more commonly known to Europeans, the real head of the Empire, lived in semi-sacred seclusion at Kioto, whilst the Shogun or Tycoon lived at Yedo where he was the virtual ruler and head of the government as the Ten-shi's deputy. The position of Shogun was hereditary just as was that of the Emperor himself, but from having held the position for so many centuries they claimed absolute power and freedom of action without any reference to the Ten-shi, and that he was the executive head of the State. In 1862 the Shogun was cited by the Emperor to appear at Kioto; he did not go at that time, but later on, when he did go, it was admitted that he was only a vassal of the Ten-shi, and this was undoubtedly the beginning of the end of the rule of the Shoguns, the complete overthrow being accomplished in 1868.

As there were two rulers it is but natural that there should be two political parties and on the coming of the foreigners these parties ranged themselves under two very distinct banners. One was the Jo-I, who sought the expulsion of the foreigner and the continued seclusion of Japan, the others called the Kai-koru whose main policy was progress and the opening of the country to western methods; feeling between the two parties ran high and was very marked. Eventually the Jo-I became the O-Sei, in opposition to the Bak-fu or military curtain government, by which was virtually meant the rule of the Shogunate. All who were opposed to the prevailing system of government ranged themselves under the banner of the O-Sei, not necessarily thereby opposing themselves to the foreigner, and when the cry of expulsion had served its purpose the leaders of that party were quite willing that it should cease to exist, and it may be said with perfect truth that

many of Japan's foremost statesmen of after years were at one time allied with the O-Sei organization, yet we know they all stood for progress and advancement. The cry of the O-Sei was "the expulsion of the alien" but its real ambitions were "Down with the Shogunate."

Shimadzu, Prince of Satsuma, and Mori, Lord of Cho-shiu, the two most powerful daimios or nobles at the southern end of Japan had formed a league for "the expulsion of the barbarians and the restoration of the Ten-shi to full control," but the feudal system flourished and the Shogun was at the height of his power and every daimio owned allegiance to the Emperor's deputy at Yedo. The country was, however, far advanced in those revolutionary troubles preparatory to the crisis which had been surely coming for the past hundred years, but which was accelerated by the presence of the foreigner, whose coming had disturbed an elaborate political machinery. The Civil War of 1868, under which the dual system, feudalism and the "curtain government" of the Shogun were to pass forever, had really begun, though foreigners who did not know Japan supposed it was simply the revolt of two great feudal daimios from their suzerain and that it was simply a quarrel between Satsuma and Mori on the one side and the Shogun on the other.

When Commodore Perry landed at Uraga, as already stated, the villagers were filled with consternation, as no direct communication had been held with the outside world for over 230 years and it was in direct contravention of the laws of the Shogun to hold any communication with foreigners. The head man of the village undertook to have the letter forwarded to the ruler of the country and the commodore obtained the promise of a treaty at some future time; this was obtained during the following year. The advent of this foreign officer during such an unsettled state of the country served but to accentuate the difficulty of the position of the Shogun and his party, for if he yielded to the demand of the President of the United States as contained in the letter, that the country should emerge from its self-imposed seclusion and allow foreigners to enter within its gates, he would incur the wrath of the nobility, or at least a certain part of them, whilst if he refused he might find his country facing a hostile invasion and perhaps become an India or a China, which would be quite as disastrous to himself as forcing the exclusion of the foreigner. So

he took the counsel of men who advocated the making of treaties with people whom Japan was not, at that time, strong enough to effectively exclude, and thus was inserted the thin edge of the wedge—at first nothing more than a promise of friendship—between the United States of America and Japan, but it was the thin edge, for very shortly afterwards a treaty was negotiated which granted the right to establish a legation at Shimadzu, a small town on the Idzu peninsula, some sixty-five miles southwest of Kanagawa. In 1858, Lord Elgin concluded a treaty granting rights to establish legations in Yedo, but as feeling was running very high against the foreigners it was eventually agreed that they should be settled at Yokohama, a small village close to Kanagawa, but off the main road connecting the two ancient capitals. Our relations with Japan in those early days were very disturbed, as the party opposed to foreign intercourse was powerful and truculent.

In 1861 an armed force of ronins attacked the British legation in the middle of the night, killing and wounding many of the inmates. These "ronins" were armed bands going about the country making attacks on foreigners; they had mostly been retainers of some great feudal lord who had now become adventurers, rather than mercenaries, drifting with the political current of the hour.

Anxieties were further multiplied for the Baku-fu party when, in 1862, the Ten-shi sent an envoy to Yedo to require the Shogun to proceed to Kioto, there to discuss the political situation and concert measures with the other great nobles of the land for the expulsion of foreigners. Shimadzu, a Prince of Satsuma, and uncle of the head of the house of Satsuma, undertook personally to proceed to Yedo to escort the Imperial Envoy or Viceroy to and from Kioto, and proceeded there with six hundred of his clansmen. He had other ambitious objects in making the journey, but it is only necessary now to state that he completely failed in all. He was treated in Yedo with coldness and hauteur, and on that fateful September 14 he left Yedo with all his followers and commenced his long journey down the Tokaido, or great road, that connects the two capitals, passes through Kanagawa and within a short distance of Yokohama: it may readily be understood that he was not in the best of good moods as he travelled homewards. It so happened that on that same day a party of

English, some visitors from China and others, merchants from Yokohama, and consisting of Mrs. Borrodaile and Messrs. Richardson, Marshall and Clarke were riding along this same road within treaty limits. At first they met the usual crowds, then the advanced party of the noble's guard, and then that of the prince himself, seated in a palanquin. In Japan, when a great noble passes it is the rule to give a clear road and to make obeisance, but this pleasure party was either little versed in the customs of the country or else they were somewhat arrogant, for they went riding on taking no notice whatever of the great man who was passing. When close to the palanquin of the prince, Mr. Richardson was cut down by a Japanese sword and his body hacked to pieces. Mrs. Borrodaile narrowly escaped death, by the opportune falling of her hair, which was cut. Mr. Marshall lost an arm, and Mr. Clarke managed to escape, though hotly attacked. News of the occurrence soon reached Yokohama and a small force of blue-jackets and men from the minister's escort went out to the scene of the disaster to bring in the body. The writer was one of this party and well remembers the scowls and evil looks on the faces of the natives he met, but the prince's party had already passed and no further attack was made. Colonel Neale, British chargé d'affaires, in the absence of Sir Rutherford Alcock, called on the Shogun's government for the punishment of the murderer and compensation to the victims. After prolonged negotiations the Japanese alleged—and we now know that they simply stated what was the truth—that they were powerless to coerce the Prince of Satsuma in his distant dominions; so Admiral Kuper and the British fleet took the matter in hand and in August of the following year a considerable squadron left Yokohama for Kegoshima, the capital of the Satsuma territory, situated at the extreme south of the Empire. An ultimatum was sent ashore requiring the execution of the murderer of Mr. Richardson, in the presence of the British officers, together with the payment of compensation to the relatives of the murdered man and the victims, the amount being fixed at £25,000. This was refused and the Japanese did not wait for the fleet to open fire, but took the initiative themselves, and with unquestionable courage and skill. The admiral immediately seized and destroyed three steamers belonging to the prince and bombarded the town. A fire broke out, which, owing to a typhoon blowing at the time, destroyed

more than half the town. The fleet drew off and the Yedo government paid the fine.

The writer arrived at Yokohama in the spring of 1861 from Tien-tsin, where he had been frozen in on the Pei-ho River for four months, at the close of the China War of 1860, so that he was in good time to be in the thick of all the anti-foreign troubles in Japan. The occurrences at Kegoshima were made the subject of a debate in the House of Commons, when Sir Rutherford Alcock was entirely sustained in the retaliatory measures he had pursued. But the debates and the occurrences together were, in an indirect way, the cause of two midshipmen leaving the navy. It is a curious coincidence that they both entered the army, one meeting a soldier's death in Zululand, the other being the writer.

Shimadzu has been referred to as the uncle of the head of the house of Satsuma, but some little explanation is required for this. The previous daimio was Shimadzu's brother, and he adopted the then young ruling prince as his son and it followed under Japanese law that the father became uncle to his own child, so that Shimadzu was the father and nominally the uncle of Satsuma; hence the reason for his being so prominent in the affairs of his country at this period.

It is somewhat important that the geographical position of Cho-siu and Kiu-shiu be fully understood to be able to follow the events of the next year or more in Japan. The Empire consists of four principal islands: in the far north is Yeso, which may be eliminated from this article, as it does not play any part in the episodes; next comes Hondo, by far the largest of the group and it may be considered the mainland; the capital is situated on the east coast of this island: then Shikoku, which is, as it were, jammed in sideways and under the instep of a foot formed by the southern end of Hondo: finally comes Kiu-shiu which is separated from Hondo by the narrow Straits of Shimonoseki. The Ten-shi or Mikado's capital at Kioto is also situated on Hondo, in the middle of the instep referred to. The Satsuma family held sway in Kiu-shiu and Mori was lord in Cho-shiu, which is situated on that part of Hondo which stretches down to the Straits of Shimonoseki: therefore the Lord of Cho-shiu on the north and Satsuma on the south held the straits. Well realizing the strength of his position, Mori opposed the passage of foreign vessels entering the straits from the west and Satsuma took sides

with him and the two thus became involved with the Baku-fu, *i. e.*, the Shogun, concerning the right of way. Mori signified his disapproval by firing on ships attempting the passage. The Baku-fu had failed to convince him that the channel ought to be open to all comers, and despairing of its own ability to put a stop to the systematic interference with foreign shipping, had authorized the admirals of the western powers to take such measures as they thought best.

June 25, 1863, was the day fixed for the expulsion of the "barbarians" and on that same date the American merchant vessel *Pembroke*, having a pilot furnished by the Yedo government, was on its way through the straits, and was fired on by the land batteries and the guns of the armed brig *Ko-sei*, formerly the *Lanric*, but was not damaged. Thus the peace of centuries was broken. On July 8, the French despatch boat *Kien Chang* was hit in several places. A boat was lowered to enquire the reason for such an attack, but a well-directed shot immediately sank her and nearly all the crew were killed or drowned, the vessel herself being saved by a lively use of the pumps. Three days later the Dutch frigate *Medusa* was hit thirty-one times, seven shots piercing the hull and three 8-inch shells bursting on board: four men were killed and several wounded. On the 20th of the same month the French gunboat *Tancrede*, though steaming rapidly through the channel, was struck three times before she got through. Then, not long after that, a steamer belonging to Satsuma was mistaken for an alien vessel and was fired upon: she was set on fire by the shells and sunk, twenty-six Japanese losing their lives. There was ample proof that the Cho-siu artillerists had learned their lesson well, and they were in high glee over their successes. They believed that with their armed brig, their bark (formerly the *Daniel Webster*), and an iron steamer of 600 tons named the *Koshin*, formerly the *Lancefield*, they could lick creation. What most astonished the Hollanders on the *Medusa* was the projectile, such size and weight being undreamed of; to find 6- and 8-inch shell exploding on their deck was a novelty to the Dutchmen in the Eastern world and showed that the Japanese were up to the times. The American sloop *Wyoming*, under the command of Commander McDougal, was the next to retaliate on the hostile clansmen, but as I am in hope that this article will be read by officers of the American Navy, who have just cause to be proud

of the deeds of McDougal and the crew of the *Wyoming*, I will make a special chapter of that engagement; moreover, I am not dealing with the deeds of a single foreign nation just here.

The French ships *Tancrede* and *Semiramis* then went out to punish the war-like holders of the passage for their attack on the *Tancrede*. They subjected Shimonoseki and did considerable damage, but here again the Japanese displayed good gunnery and courage. Next, a combined fleet comprising British, French and Dutch vessels steamed out from Yokohama and the battle of Shimonoseki of 1864 was fought. The Americans had no war-ship in those waters at the time to represent them, so they sent out an unarmed chartered vessel, but she took no active part in the engagement.

The British contingent consisted of nine ships of various sizes: There was Admiral Kuper's flagship, the *Conqueror*, 101 guns and to which the writer belonged, the frigate *Eurylus*, 51 guns, the corvette *Barrosa*, 22 guns, *Tartar*, 20 guns, paddle sloop *Leopard*, 18 guns, *Bouncer* and *Coquette*, 4 guns each, and the paddle sloop *Argus* with 6 guns, also the *Perseus*. The French sent five ships and the Dutch four, the *Medusa* being one of that number. As was the custom amongst British middies when anything exciting was on in those days, I managed to get a little fun out of the fight as well as the excitement: burnt powder was not new to several of the other midshipmen on the same ship as myself, for we had been present at the attack on and taking of the Tanku and Taku Forts, at the mouth of the Pei-ho River in 1860, and some of us had been up to the sacred city of Pekin. Of the battle itself there is little enough to be said. The vessels of the various powers took up their allotted position just out of the strong current, and early the next morning prepared for the assault. Not without warning, however, for due notice had been given of the intention. The Cho-shiu batteries were eight in number, the first being three miles to the east of the town of Shimonoseki, thence extending up to the hill opposite Moji Point where the main street of the town begins. In all, there were mounted some seventy-five guns in these batteries, and the instant that the guns of the ships opened fire a most lively response was made by the Japanese gunners. The most powerful of the Cho-shiu guns were mounted at a small village half way between the town of Shimonoseki and another village named Cho-fu.

After some pretty severe fighting, in the course of which the town caught fire and burned fiercely, the batteries were silenced and some blue-jackets were landed to aid in extinguishing the fire. The natives were not all armed with firearms as one sailor on the *Tancrede* was killed by an arrow. After the surrender of the forts was completed, a document was drawn up for Mori's signature, agreeing to certain conditions under which the allied squadron should retire: the document was duly signed and returned after two days, and the guns from the batteries were taken on board the fleet which then drew off. An indemnity of £600,000 was eventually paid, irrespective of the amount claimed by and paid to the owners of the American ship *Pembroke* which, as already stated, had been fired on. Of course the loss of the guns put a stop to the firing on vessels passing through the straits. Though the Cho-shiu men were very proud of the resistance they had made against so many vessels, they have not forgotten the behavior of the British in landing a party to assist in extinguishing the conflagration which the fighting had caused. The French lost three men killed and the Cho-shiu had between fifty and sixty men killed and many wounded.

The act of Cho-shiu in firing upon the foreign vessels marked the beginning, not only of a foreign war and "The first deed of arms in Japan" as it has been called by a native historian, it marked also the beginning of a civil war and a long political struggle which was to end only with the revolution in 1868. For all that, Japan had not failed to properly learn the lesson she was taught from the fighting with the foreigners. She learned the lesson and she immediately set to work to profit by it. At the time when dissensions between the two parties were at their height the Shogun, being only fifteen years old, was not able to lend any assistance to his party; Shimadzu, acting for his nephew (son) the Prince of Satsuma, exerted all his influence to reconcile the conflicting interests of the contending factions, but without avail, and matters were in this condition when the Shogun decided to proceed to Kioto in answer to the summons he had received from the Ten-shi during the previous year; there was a half-hearted reconciliation between the ruler and his viceroy or deputy and for the moment harmonious relations were re-established. But a personal quarrel occurred between the Shogun and Mori, Lord of Cho-shiu, which would have been much more serious

for the Shogun had Satsuma been quite ready to throw in his lot with Mori. As it was it ended disastrously for Mori, who was sent down to his own dominions by the Emperor, and the Shogun remained in favor. The Cho-shiu clan was from that time directly and openly opposed to the Shogun's party and were so indignant at the insult thus put upon their lord that they marched to Kioto and attacked it. In the fight that ensued the clansmen were opposed by the troops of the Shogun, who had been directed by the Emperor to punish Mori for the outrage, and at the same time Mori was deposed by edict of the Emperor. But Mori and his men cared little for either Emperor or Shogun and raised the standard of revolt in the west of Japan. Then, at the head of a numerous army, he set out again for Kioto where he met the troops of the Shogun in a series of engagements which ended in the Shogun's defeat. This was fatal to the Shogunate, for whilst it is true that he had already made the admission of vassalage to the Ten-shi, that was simply an admission that the power of the Shogun had its limits. Satsuma had failed to support Mori, but that did not indicate for a moment that he supported the Shogun, and by this time some of the more powerful of the provincial daimios had fallen away from their allegiance to the Shogun and had ceased to attend the court at Yedo, or even reside there during the prescribed six months in each year. The whole country between Kioto and Yedo now became infested with ronins, outlaws by choice, adventurers by nature, men who had become free-lances for the sole purpose of not involving their daimios in trouble on account of their actions, and it was perfectly unsafe for single persons or even small parties of foreigners to go out riding beyond the limits of the town, even within the treaty limits. Within a very brief space of time several assassinations took place, including Major Baldwin and Lieut. Bird, of the British regiment stationed on the Bluff, of Mr. Hueksen or Heutsen, of the British legation; of an officer of the French 101st Line Regiment, and of several others. The chapter is a painful one in the history of Japan and she has so long repented for the misdeeds of a few of her misguided people and as these misdeeds certainly did not have the approval of either party in the country at that time, it would certainly be nothing but generous of the English to say little to remind the Japanese of it.

Matters were going along in this way till the early part of

August, 1865, when the flagship of Admiral Kuper was ordered away from Japan, and on the 12th of that month the writer set sail on that ship from Yokohama Bay on his way to lands far distant. We had not been under way very long till we met our old friend, the *Argus*—already referred to as being with us at the bombardment of Shimonoseki—she had mail for us which was soon transferred, and once more we had a look at the place where the batteries had proudly, or should I say arrogantly, defied the foreign "barbarian." And thus ended my period of service in Japan, and in fact in Eastern waters, but I was certainly there during the stirring days when history was in the making, and history has seldom been made in "the piping times of peace."

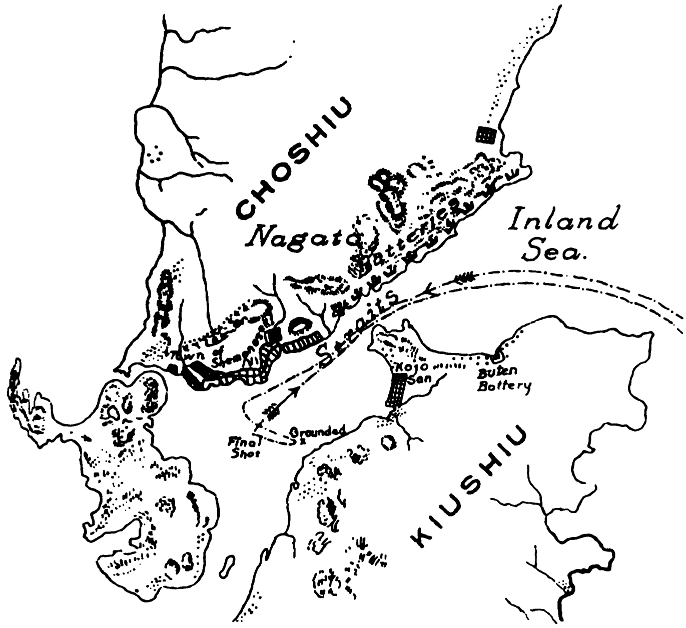
JULY 16, 1863. AN EPISODE.

In the previous pages an attempt has been made to tell of events in Japan leading up to the summer of 1863 when, according to the decree of the Shogun or Tycoon, the "hairy barbarian" was to be expelled, and Mori, the powerful daimio of Cho-shiu attempted to bar the passage of foreign vessels through the Straits of Shimonoseki by firing on them. June 25 was the date set for the carrying out of that decree, and on that day Mori was provided with exactly what he wanted to enable him to carry out his part in the program, for during the afternoon the American merchant vessel *Pembroke* entered the straits on her way to Nagasaki and China, having on board a pilot that had been supplied by the Yedo government: she was fired on by the land batteries, also by the guns of the armed brig *Ko-sei*, but escaped unhurt. Thus the peace of two centuries and a half was broken. In April of that same year Commander McDougal, of the U. S. Navy, in command of the *Wyoming*, was in Hong Kong looking for trouble, in the shape of a Confederate privateer; he received orders from Mr. Pruyn, the United States Minister in Yokohama, to bring his ship to that port, and to have her guns ready for service as the Japanese were beginning to give trouble to foreigners. Incendiarism and assassination on the part of the "ronin" were on the increase and, as a matter of fact, the U. S. legation was burned very shortly after the arrival in port of the *Wyoming*, but whether by accident or design, could never be found out. On July 11 Commander McDougal heard from his minister the news of the firing on the *Pembroke* on the 25th of the previous month, the

news having come up from Shanghai, and he was glad enough that Mori had provided an immediate substitute for an *Alabama*. Nothing daunted by the fact that he was not acquainted with the passage of the straits, neither could he obtain any chart of the place, he ordered coal on board and procured two pilots from the government; then he lost no time in sailing out to Shimonoseki.

The *Wyoming* was a sloop of war of 700 tons; she carried four 32-pounder side guns and two 11-inch Dalhgren pivot guns. She carried a crew of 160 officers and men, all of whom seemed "fit," and they composed a really good crew. The writer was the very first to board the *Wyoming* on her arrival in Yokohama, carrying a message from Admiral Kuper, and he had many opportunities of revisiting the ship during her stay in port, becoming very intimate with most of the officers and forming a great liking for and mutual friendship with that kindly old gentleman and thorough sailor, Commander McDougal. It is on account of this friendship and the intimacy with the other officers that enabled him to get a true account of the "episode" at first hand and quite ungarnished, and from having visited the scene of the action, he felt almost that he had seen the whole thing. As can be seen from a study of the accompanying sketch the Straits of Shimonoseki form the western gateway of the Inland Sea, the actual straits being about three miles long and from one and a half to two miles wide, but the navigable channel is only from three to seven hundred feet wide. The town consists principally of one long street running along at the foot of some bold bluffs, and there is a ravine in which the houses cluster pretty thickly; the population was, at that period, about fifteen or sixteen thousand persons. The batteries, or more correctly speaking, the redoubts or platforms where the seventy-four guns were mounted, extend from a point at the extreme east of the straits right up to the town itself; the village of Chofu, where the heaviest guns were mounted, being nearly in the middle of that line. There is also a ten-gun fort named Buzen on the opposite shore, but in such a position that it could not come into action against any ship that was attacking the town of Shimonoseki, facing some of the more easterly of the Cho-shiu redoubts. Amongst other guns on shore there were several 8-inch Dahlgrens which had been given to the government at Yedo, but in some way had got into Mori's hands. As well as the shore batteries, the Japanese had three vessels which have been described in a previous part of this narrative.

The *Wyoming* entered the narrow straits at 6 o'clock on the morning of July 16. Signal guns were fired from the first redoubt and passed along as far as the town. Before coming within sight of the town the first shot fired struck the ship above the engine room. No reply was made to any shot, however, till rounding the Monshi promontory on the southern shore, when the three ships and the whole town burst into view. Commander McDougal had taken care to ascertain the exact draft of the iron steamer already referred to, for he knew that where she could go



SHIMONOSEKI, SHOWING THE ROUTE OF THE U. S. S. WYOMING. JULY 16, 1863.

the *Wyoming* could follow. Stakes had been driven into the mud on the edges of the navigable channel and it was evident—even from the first shot fired—that the Japanese knew the exact distance and expected to blow the ship to smithereens. The steamer *Koshin* was lying close in under the forts and McDougal ordered the man at the wheel to steer direct for her as he intended to take her. The pilots got frightened and told him he would run his ship on shore as there was not enough water, and they were doing all they could to keep the vessel on the southern

shore: it was evident they were not accustomed to hear shot and shell flying about. As soon as the *Wyoming* was seen to be steering for the northern shore and the steamer, another battery, up the side of the hill, began to fire; this was one of the batteries that had an 8-inch Dahlgren. About then another battery also opened fire, and then was shown McDougal's wisdom in steaming out of the staked channel, as the shot now began to pass above the hull and up in the rigging. The three Japanese men of war carried eighteen guns between them. Even by this time, the *Wyoming* had several wounded and three killed. As the ship neared the Japanese vessels her flag was run up amidst ringing shouts and cheers, but was at once saluted from a fresh shore battery of four guns. By 10.30 a. m. the American vessel was in front of the town and dashed in between the steamer and the two brigs and was soon abreast of the *Ko-sei* which fired a broadside from her four brass 24-pounders. The *Koshin* was not able to do very much damage, her guns being pointed up the channel; but the brig was so close that the faces of her crew were plainly discernible, and the guns of the two ships were nearly touching each other. So rapidly did the Japanese work her guns that no less than three broadsides were fired before the *Wyoming* passed her. As she passed between the two Japanese ships she fired broadsides from both sides, and every shot found its billet. Now the inevitable happened; the *Wyoming* cleared the steamer and steered over towards the southern shore, and all the shore batteries getting the range again, together with the guns on the bark, concentrated their fire on her, and—she grounded—but despite that fact and the holes torn in her side by shells, she still vigorously continued firing: the *Koshin* had slipped her cable and made towards the shore under the batteries, either for the purpose of escaping or to attempt to ram and board the American ship. One of the brigs showed signs of distress and was evidently about to sink. But McDougal was not content to carry on the fight with his ship in the mud, so he set her propeller to work to get her off; fortunately this was a powerful one and after several attempts she floated again. The grounding took place close under the southern or Kiu-shiu shore in front of a village, and right opposite to the western extremity of the town of Shimonoseki. Ignoring the sinking brig, the *Wyoming* paid all her attention to the on-coming *Koshin*. In doing so she had to con-

tend with the swift running current. The bow chaser was the gun that proved of most service at this moment, as the broadsiders could not yet come into play; the bow gun, however, did its work well; the second shot passed through the vessel; it pierced her side just above the water-line, smashed the boiler, came out on the other side and exploded in the town half a mile away. Great volumes of steam rose from the disabled ship and spars and wreckage were hurled up in the air. The officers left the ship in rowing boats to pull for the shore and the crew jumped overboard to swim away, and the steamer sank from sight; at least forty of these men lost their lives. At this time the *Wyoming* was well past the town itself and had her work cut out to make way against the very powerful tide, as she had plenty of work before her yet: the bark was still firing as fast as she could serve the guns, and the guns in the batteries were finding their target. McDougal decided to settle the bark first and then give all his attention to the shore guns. The bark was soon disabled and worthless. On her way back the *Wyoming* dropped most of her shots right in the batteries, one of which was completely destroyed. Half an hour after noon the firing ceased, the *Wyoming* having fired from fifty to sixty shots in all, the enemy must have fired one hundred and thirty or more shots during the same time. The *Wyoming* lost five men killed and seven wounded: she was holed ten times and her smokestack had six holes in it, her masts were injured and her rigging was pretty badly cut up. The Japanese lost two vessels sunk and the other disabled; one battery destroyed and many killed and wounded; the number of their casualties was never ascertained, as in Yokohama we were dependent on Yedo for information and the reports from there were erratic. There is no doubt whatever that the shore guns were well mounted, and the first idea that they were fixed so as to fire on the staked channel was soon found to be incorrect: the Japanese also fired a great variety of missiles, such for instance as round shot, shell, grape, canister and even chain-shot.

Honor and glory come to some men so easily and there is no doubt that McDougal was entitled to all the glory and honor he ever got for the part he played in the opening up of Dia Nipon. Perhaps had the United States not been busy attending to other matters nearer home at the time, McDougal would have had his services duly recognized, forgotten they certainly have not been.

During the engagement the *Wyoming* was under fire from three ships, and, at one time or another, of eight batteries and either one or two gun redoubts. Before she got through she sank two of the ships, made a lame duck of the third: she went aground and worked off again without aid, she disabled at least one of the batteries and silenced several of the others. She carried only six guns herself, but had opposed to her no less than ninety-two guns, some of which were heavy ordnance.

> When shall her glory fade?
> Think, think of the wild fight she waged!

For this little "episode" the United States collected $12,000, part of which went to the owners of the S. S. *Pembroke*.

On entering the harbor of Yokohama the following day, the *Wyoming* was greeted with ringing cheers from the *Conqueror* and other British war vessels as well as those of other nations then at anchor, and Admiral Kuper made haste to congratulate Commander McDougal. Very shortly afterwards, having made good her damages, the *Wyoming*, in compliance with orders she had received prior to coming to Japan at the urgent request of the U. S. Minister, left the East for home waters. She had the hearty good wishes of all who remained behind, and dozens of people lined the Bund to see her steam out. The writer, too, felt that he had lost a friend as she turned the point and sank from sight, but there has always been a lingering memory and pleasant recollections in his heart for as kind and good natured a friend as ever he had in his life in the person of David McDougal.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ON THE DESIRABILITY OF A UNIFORM TYPE IN BATTLESHIPS.

By Rear-Admiral Caspar F. Goodrich, U. S. Navy.

A battleship may be called upon to fight a single-ship action; or she may fight an action as one unit in the fleet. If we could be certain in advance which of these rôles she is destined to fill, would this knowledge exert any material influence upon her design? In seeking the answer to this question I am led to a conclusion in the affirmative.

When acting alone, it is not to be doubted that she should be as powerful as possible in offensive and defensive qualities. The more guns and armor we can give her the better, together with a reasonable speed. Undue development of the last-named characteristic can only be secured at the sacrifice of protection or at the cost of excessive displacement; while the resulting superiority is of little value unless relatively so great as to appear abnormal. If the results of careful study on the part of thoughtful and competent men are to be accepted, this difference must not be less than 25 per cent; indeed, some of those best qualified to speak hold that this figure should be nearer 50 per cent.

It seems to me that the striving to produce battleships, each more formidable than its possible competitors, is a distinct adoption of the idea of the single-ship action as the keynote of naval policy on the part of the nation whose ship-building programme presents this unmistakable trait. This adoption will doubtless be denied, and with truth, so far as intent is concerned, but, practically, erroneously and against the logic of facts. The value of uniformity in battery command and in tactical properties, in such cases, goes unrecognized; the product is a collection of diverse types and not a homogeneous fleet. Such is our case to-day.

Everything in the mechanical world is a compromise. And this truism is especially applicable to ships' designs. As we cannot have all we want on a limited displacement, would it not be well to make up our minds to accept this disheartening and inexorable condition and take the broad view that to what the fleet needs the individual vessel should be subordinated? Here, again, I say "Yes"—although I am well aware that an opposite view may be strongly held, viz., that the strongest individual units must of necessity combine to make the strongest fleet. To this I am, of course, entirely ready to agree, provided these units be uniform in their attributes of offence, defence and maneuver—or if not absolutely uniform then fairly so. I do not care to impose too exacting conditions.

Again, if assured that the units of his fleet were reasonably alike in their ability to deliver and receive hostile blows, would not a commander-in-chief feel more confidence in his conduct of a battle when these units possessed identical maneuvering qualities than when they presented these qualities in quite discordant array? While I may be mistaken on this point, I hold, with considerable pertinacity, the view that homogeneity is what he would gladly have if not obliged to give up too much of the combatant powers—offence and defence.

The most important feature in a battleship's design is, unquestionably, the arrangement of the battery. After many experiments the axial line has come to be recognized as offering the maximum of advantages. To that disposition we are now, I had almost said irrevocably, committed. Holding fast to this basic idea, we have placed the third and succeeding turrets also along the ship's axis, and to secure unrestricted gun command the third and fourth turrets are installed on a somewhat higher plane than the others. All this is so reasonable that this, which may justly be termed the American scheme, has been adopted by other powers. If we place the fifth and sixth turrets in accordance with this principle, they will operate in a plane of their own, and we shall see our guns in three stories, as it were. That development we have not reached, doubtless for reasons of stability. Theoretically, it is the only proper way of mounting our battery—practically, we are forbidden to do so, and thus are driven to expedients which, in the cases of the *North Dakota* and the *Minas Geraes,* deprive some of the guns of their full value. To me it appears

fairly debatable whether we do not pay more in a number of disadvantages for this extra turret or so than they are really worth. If we require greater hitting power might not this be obtained by increasing the caliber of our guns and at the same time hold to the four turrets in two planes with all the incidental profits they offer?

Five or six turrets necessitate a much longer ship, for one thing, and a much greater area proportionally of surface to be protected. A glance at the designs of such vessels will show an enforced thinning of armor, especially above the water-line. Now, this is to run a great risk. As a general criticism applicable to all recent construction, I feel warranted in saying that insufficiency of protection is a universal characteristic. Wider armor belts and thicker casemates are imperatively necessary to give our ships the ability to receive as well as to deliver heavy blows. This ability may be defined as armor thick enough to keep out her own projectiles at the ranges to be expected on opening an engagement. By this I mean, not the proof butt normal impact penetration, but about two-thirds or three-fourths, since battle impacts will always be at an angle.

I refer, of course, only to those vital parts which must be protected at any cost. Tested by this old eighteenth-century rule, that "a ship is built to fight her fellow," all modern battleships, no matter what be the flag, will be found wanting. In my judgment, this state of things is serious. It can only be remedied by assigning of the displacement a larger fraction than is our custom to "protection"; and this remedy can be greatly facilitated by avoiding extreme lengths in the ship herself, and by frankly abandoning the fad of excessive speed.

The knotty problem of the right horse-power to provide might be attacked by considering the radius of action the ship should possess. Knowing the displacement, at least approximately, and thus having a pre-supposed number of tons available for coal and propelling machinery, it should be no difficult matter to divide this number into two parts, one for fuel, the other for engines, boilers, etc., and by the method of trial and error reach a conclusion that would enable the ship to cover the assigned distance at the maximum cruising speed. The weight of machinery thus determined would in turn fix the ultimate horse-power and the trial speed. Such a procedure would be logical—based on

strategic considerations—and so capable of defence in the forum of service discussion. Arbitrarily to demand some particular trial speed, or to support the demand by the plea that "the Persians are building battleships" with that particular speed is amusing rather than convincing. We should have what we want, but it is equally important that we should know why we want it. Our reasons ought not to display a simian imitativeness, but should be founded on strategic and tactical study, as interpreted by that greatest and sternest of teachers—history.

Would you have an example? Many of Rojesvenstky's ships had a nominal speed of 20 knots—and doubtless they made this rate on their trial trips. To secure it, their side armor had to be made thin. On the day of battle can it be doubted that he would gladly have exchanged the five extra knots which, by the way, he didn't have when the pinch came, for four or five more inches of armor on his casemates? If you bolt armor to a ship's side it is always there, but the high speed you have purchased by giving up some measure of protection may not be yours at the critical moment. A bearing may get hot—an auxiliary pump may fail—any one of a thousand things may happen to reduce your speed, but your power of resisting an enemy's shells is at its maximum at all times until weakened by his hammering. Had Rojesvenstky's ships possessed those extra inches on their casemates, instead of armor inadequate to keep out projectiles, and yet just stout enough to effectively explode them, it is conceivable that Togo might have failed.

Not only does the four-gun turret ship permit the adoption of greater protection, but it furthermore yields other incidental advantages—a capital platform for the torpedo defence guns; an ample space for the stowing of boats; a compact and convenient arrangement of the magazines and shell rooms; and the best possible provision for habitability.

A fifth turret introduces complications that are by no means insignificant. Its magazine is of necessity close to a fire room, thus calling for mechanical refrigeration. The structural problem, too, is not without its drawbacks. Relatively, the fifth turret demands more than its share of strength in meeting the strains and stresses on the hull, and it imposes an undue burden on the naval architect. These he has been able to deal with, I know, but after all, is what he gives us really worth while?

In spite of the lack of sufficient protection on their casemates, I think our *South Carolina* and *Michigan,* as a type, the best ever developed. Either of them is to-day more than a match for the *Dreadnought.* Why not stick to so excellent a design? If more battery power is required—is there any reason why three 12-inch guns each might not be placed in their lower turrets, or in all? If this is impracticable or undesirable, make her guns heavier, but never let us be diverted from that which is sound and good because other nations are groping in the dark and producing vessels that, in comparison with our simple and powerful *Michigan,* may not unfairly be termed freaks. It is time to call a halt on building single ships or ships in pairs, and to build fleets.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AVIATION AND AEROPLANES.*

By CAPTAIN W. IRVING CHAMBERS, U. S. Navy.

THE MEET AT BELMONT PARK, N. Y.

At this tournament an opportunity was presented, for the first time in the United States, to view the latest Bleriot, Antoinette and Demoiselle monoplanes, perfected in France, in daily competition with the American biplanes of Wright and Curtiss and the French biplane of Farman. A Curtiss type biplane, belonging to Mr. Hamilton, fitted with a 110 h. p. Hamilton motor, from which great speed was expected was also exhibited, but it made a poor showing at Belmont Park, due, it is said, primarily to an engine which refused to keep warm. It is recorded in the daily papers, however, that Mr. Hamilton has since made four miles in 3 minutes 1 second, with this machine at Memphis, Tenn., or the remarkable speed of 79.2 miles per hour.

A new model Curtiss machine attracted much interest. It was a small high power biplane, or rather a monoplane with a small upper plane over the driver. This was intended to defend the international cup that Mr. Glenn Curtiss had won in Europe, but unfortunately it left the ground for the first time after the cup race.

There was present also a curious, unclassified model of American design, in the hangar of Mr. Clifford Harman, which was not used. It consisted, principally, of a central cylinder about seven feet in diameter, placed horizontally, with single planes each side, the motor and propellers being located within the cylinder.

* A report of observations on *Aviation* and *Aeroplanes,* made in obedience to orders of October 21, November 1, and November 12, 1910, to attend the aviation tournaments at Belmont Park, N. Y., and Halethorpe, Md., and to direct an experiment in aerial flight from the U. S. S. *Birmingham;* including recommendations concerning the study and development of aviation in the Navy.

Two Americans at this meet, whose instruction in aviation has been received abroad, Mr. J. B. Moisant and Mr. J. Armstrong Drexel, drove monoplanes of the Bleriot type. Not one foreigner actually used a biplane, except the Englishman Mr. C. Grahame-White, who occasionally drove a Farman biplane. It is probable that he did this from choice, judging from the extensive use he had made of it during the previous meet here at Bennings, although the fact that his 50 h. p. Bleriot was wrecked at Bennings may have necessitated its use. It was a notable fact, however, that, in the gusty winds at Belmont Park, the biplanes were the first out each day and it was my impression that Mr. White preferred to use the biplane under those conditions in preference to a monoplane. Mr. White, however, at a late date used a high speed 100 h. p. Bleriot, which will be referred to later.

THE ADVANCE IN TWO YEARS.

It is recorded that, two years ago, when the Wright brothers and Farman were demonstrating the possibilities of flight in their biplanes, no ascensions were undertaken except during calm or perfect weather conditions, but the demonstrations at Belmont park and at Halethorpe were quite different. The weather was never ideal for flying. There was not a day during which the wind currents were not treacherous, and at Belmont Park there was only one very windy day during which the machines were kept in the sheds. Had this day not been Sunday, it is probable that some of the Wright biplanes would have flown. On the second day of the meet at Halethorpe a heavy downpour of rain, turning into hail and snow, accompanied by heavy winds, wrecked the large tents used as hangars and damaged two Curtiss biplanes beyond repair. It also caused damage, to a less extent, to the monoplanes of Radley, de Lesseps, Drexel and Latham, yet all of the monoplanes were soon repaired and flying in gusty winds with the Wright biplane, driven by Hoxsey, that had arrived after the destruction of the hangar. I gained the impression that repairs to these monoplanes were greatly facilitated by their method of construction, which permits the ready substitution of spare parts. Latham's Antoinette, for example, was slightly damaged in one of the planes, or wings, and a spare wing was quickly substituted. Radley's flier was badly smashed, but he had it in action before the end of the meet. It was not so imperative, however, to repair the Curtiss machines, as two others were readily sent to replace them.

THE PRINCIPAL EVENT AT BELMONT PARK.

The race for the Gordon-Bennet Cup, or *Coupe Internationale d'Aviation,* which by tacit consent of the various bodies or clubs governing aeronautics in the world, determines the world's championship for speed in aeroplanes, was the most important event of the meet, from the viewpoint of sportsmanship. This was won by Mr. C. Grahame-White in a 100 h. p. Bleriot. This flight by Mr. White was also an important demonstration from a military standpoint. I saw Mr. White assembling the parts of this high speed Bleriot, at his hangar, late in the evening before this race. They had just been removed from the packing boxes. At 9.02 the next morning, he stepped into this machine for the first time and, without having ever used a 100 h. p. motor before, started it and immediately won the race, continuing to run over five miles more than the 62 miles required. This impressed me with the reliability of the Gnôme motors and with the ability of the French makers to deliver, disassembled, the various parts of an aeroplane guaranteed to do its duty at once after being hastily assembled. The construction of this machine and the method of boxing the parts render it possible to stow a number of them on board ship and to assemble them, ready for use, in short order. From the appearance of the American machines and the numerous tuning-up performances exhibited by most of them, I gained the impression that they had not as yet been brought to the same state of perfection, either in quality of workmanship, in convenience of assembling, or in reliability.

The Bleriots and Antoinettes were remarkable examples of clever workmanship. The Antoinettes were the most graceful of all in appearance and their wing construction especially showed such marvels of craftsmanship as one would naturally expect from Mr. Nat. Herreschoff in this country.

Mr. White's speed, however, was surpassed during the greater part of this race. One of Mr. Bleriot's favorite pupils, Mr. Le Blanc, driving probably the best 100 h. p. machine yet produced at the Bleriot workshop, appeared on the course after Mr. White and soon demonstrated his superior control by shaving the pylons more closely than Mr. White. He had evidently started hastily and without replenishing the fuel in the tank, for his fuel gave out within 4600 yards of the finish, at which time he was leading Mr. White by about five minutes. The remarkable manner in which

this machine crashed through a 12-inch telegraph pole (cutting out a piece 14 feet long) on landing, without serious injury to either the aviator or the Gnôme motor in front of him, illustrates the safety afforded by the Bleriot design.

Mr. White won this race of 62.14 miles in 61 minutes 4.74 seconds, but he continued for two laps more, and thus, counting out the first two laps, made the required distance in 60 minutes 41.65 seconds, or in 5 minutes 58 seconds less than the previous world's record of Morane. M. Le Blanc's fastest lap was made at the rate of 67.868 miles per hour. This is not the highest speed straight away but includes the retardation due to the turns.* Mr. White stated that his machine became so heated that he thought it was on fire. Although a speed of 100 miles per hour is freely predicted for the near future, this performance seems to indicate that it will have to come as a result of important improvement in the architecture of the plane surfaces rather than from increase in the motive power. The increased efficiency per horse power claimed for the Wright machines seems to indicate this.

Another interesting feature of the race, in this connection, was that Latham's 16-cylinder, 100 h. p. Antoinette, although much faster than his 8-cylinder, 50 h. p. Antoinette, did not show up well in speed by comparison with the 14-cylinder Gnôme motor Bleriots, of 100 h. p. However, Latham's speed in this racer improved on the following day over a smaller and more difficult course. This may have been due to different wind conditions, but it is probable that more experience in control had something to do with it. Walter Brookins started in this cup race in a "Baby Wright" biplane propelled by an 8-cylinder engine of 60 h. p. He encountered engine difficulties and had to descend quickly, in doing which he was injured and the machine damaged. It was stated, after this accident, that Brookins was not out officially as a contestant, but this machine had exhibited remarkable speed for such low power, it having been credited with 70 miles per hour in some of the unofficial records. During a preliminary trial four cylinders had failed to function properly and so this "hope of the Americans" showed that it had not been sufficiently tuned up to defend the cup.

* The world's record for speed over a closed course with turns was made by Jas. Radley in England. He covered a mile at the rate of 75.45 miles per hour.

THE PRINCIPAL EVENT AT HALETHORPE.

The principal event at Halethorpe was Mr. Latham's flight over the city of Baltimore in his 50 h. p. Antoinette. This was purely sensational but was done to give everybody in the city a chance to see an exhibition of airmanship.

Leaving the aviation field, near noon on November 7, Latham followed the course of the Patapsco River to Fort McHenry, thence up the inner harbor to and around the *Sun* building, thence east to the city limits; then he flew a mile north, thence west to Druid Hill Park, then south over Charles Street to Baltimore Street, thence again west and later southwest to the aviation field at Halethorpe. There was also a short detour for the benefit of a wealthy invalid, Mr. Ross Winans, during which some pretty evolutions were performed in the air. The altitude of this flight varied from 400 to 2000 feet and the wind was blowing from 7 to 15 miles per hour. The distance covered was about 25 miles and the time required was 47 minutes 31 seconds.

SOME NOTABLE FEATS.

The cross country flight of Mr. J. B. Moisant, on October 22, the first day of the meet at Belmont Park, is worthy of note and, together with the flights of others for altitude records, is of special interest to the navy. This flight, from Belmont Park to Garden City, L. I., and return, occurred in fog and rain. He quickly disappeared in the mist and after covering the distance of about 30 miles in 40 minutes, appeared suddenly almost at the starting point having managed his course by the compass much as a seaman works dead-reckoning. His 50 h. p. Bleriot differs from the others in having a tail shaped like that of a fan-tailed pigeon and it is supposed that this assisted in steering a straight course.

Moisant's flight, in which he won by a few seconds' margin, the grand prize, from Belmont Park to the statue of liberty and back, although the most sensational event of the meet, because he purchased a 50 h. p. Bleriot (in which he had never sat before) at the last moment and won over Mr. C. Grahame-White in his 100 h. p. Bleriot, was principally notable by the facility with which he managed to steer a perfectly straight course in both directions over a landscape which must have been confused by the maze of Brooklyn buildings. The accurate course of this 35-mile flight, in a

very perceptible breeze, may be judged by his average speed from start to finish (including a circuit of the track at Belmont Park) which was 60.6 miles per hour. Mr. Moisant's method of using the compass is worthy of note. He first marks off on a map or chart the course, or the successive courses, he has to make in order to reach his destination. Then, rising to a height of about 1000 feet, at the point of departure, he swings the aeroplane around to the first course, by compass, and notes the most prominent object ahead on that bearing. Disregarding the compass, he then heads for that object avoiding drift, or leeway, by keeping other objects in the course on the same line of bearing, until he reaches the first turning point laid out on his map. This would be some well charted place. He then swings the machine around to head, by compass, on the next course laid out on the map and again selects a prominent distant object to steer for on that bearing, and so on.

This method, like all navigation, is uncertain in a fog, but the air man, although greatly handicapped by the difficulty of calculating his leeway, has the advantage over the seaman in being able to rise above the fog, as the usual fogs rarely extend to high altitudes. During his flight to Garden City, Moisant kept above the fog sufficiently to see a prominent clump of trees on an elevation at his destination, the captive balloon at the turning point being invisible in the fog, and he ran his courses there and back to Belmont Park accurately by compass and dead reckoning, the principal factors in his measurement of the distance being his time and speed.

Up to the present time, although there have been several flights across the English Channel, and other large bodies of water, no flight has been made in which the aviator has been independent of landmarks for guidance. The problem of accurate flying for distances out of sight of land, or a base ship, presents greater difficulties in navigation but these difficulties are not prohibitive.

NOTE.—Captain Bellanger, of the French Army Aviation Corps flew from Issy to Formerie, in Oise, in a monoplane, on September 8, steering by compass all the way despite the fact that a dense fog prevailed. He there reported for duty in connection with French Army maneuvers and made several noteworthy flights above the contending forces, reporting the position of troops. Late press dispatches record that, on December 10, he flew from Vincennes to Mourmelon, 100 miles, in 70 minutes, or at the rate of 85.68 miles per hour. He was doubtless assisted by the wind, as it is stated that he flew at an altitude of 4900 feet "because of a high wind."

ALTITUDE FLIGHTS.

On the last day of the Belmont meet, Ralph Johnstone broke the altitude record in a Wright biplane, designated the " Baby Grand." This machine had a spread of 26 feet and four cylinders (30 h. p.), being an intermediary between the two " Baby Wrights," one of 8 cylinders (60 h. p.), 21 feet 6 inches spread, the other of 4 cylinders (30 h. p.), 22 feet spread, and the larger surface 4 cylinders (30 h. p.) " roadster " of 30 feet spread. At an earlier date, Walter Brookins had tried for altitude in this same machine, when the engine stopped at about 5000 feet. On landing, the machine was slightly damaged in the skids. Hoxey used this same machine at Halethorpe in high flying and on three successive occasions damaged the skids while landing. During his last effort this engine again stopped at about 5000 feet, obliging him to descend on a soft field, which wrecked the skids and planes beyond repair during the meet. Johnstone and Hoxsey both had the motor of this machine working, on separate occasions, during the maneuvers of landing. This seems to be a necessity with these small surfaced new model Wright machines, which have no front control planes at all, the elevator planes being abaft the vertical rudders. The aviators of both the Wright and Curtiss schools seem to think this is logical progress, but the performances of the Wright biplanes in comparison with the Curtiss and Farman biplanes, both of which had the front control, at these meets, indicate that if this is so, the new position of the elevator planes requires more skill, as in the monoplanes, to handle the machines while landing.

Prior to Johnstone's flight during which he attained an altitude of 9714 feet above the field level (or 500 feet more than the best previous record), Orville Wright had tested this machine, and after Johnstone's flight, stated that Johnstone might have reached 12,000 feet had he kept on climbing. But this is doubtful, as Johnstone's descriptions of the flight show that he repeatedly dropped into what he called " air holes " and had to swoop down 300 feet or more to gain additional speed to hurdle up to the highest altitude. Johnstone had learned that it was not possible to climb to any great height by simply turning up his elevating planes. He knew the exact angle of inclination at which he could get the best results and rise most quickly, but he found that this

angle required frequent change as he continued to climb. From the earth he could dash upward to a height of 1000 feet in one or two sweeping circles. The next 1000 or 2000 feet could be almost as easily conquered, but as he went higher "the air thinned out and grew poor in oxygen." He had to nurse the engine constantly, and had frequently to start it, after it had stopped dead, cranking up with the propellers, by using the force of the wind on their forward sides in a downward swoop of 200 or 300 feet. During these high flights, the aviators, though well protected by warm clothing, suffer severely from the intense cold (as they are unable to take any exercise during the flight), and if they remain long enough up the lubricating oil becomes stiff, or freezes, and the engine stops. Aviators using the Gnôme engine endeavor to reduce this risk to a minimum by the use of castor oil as a lubricant regardless of the expense. The effect of this intense cold, and the rarefied atmosphere, stupefies the aviator, and it requires an appreciable time after the descent before he can talk coherently. These are practical hints with reference to the use of aeroplanes in high altitudes at sea.

During the Belmont meet, Hoxsey, in altitude flights, remained aloft longer than any other aviator. His totalized altitude reached over eight miles, although his highest point reached was 6903 feet and his total time in the air, the greatest during the meet, was 6 hours, 29 minutes, 22 seconds.

A notable feature of the altitude flights was that many were made in very strong winds. On the sixth day, while the wind was blowing in gusts about 25 miles per hour near the ground, and while Latham was giving a fine exhibition of control in his Antoinette around the course, Johnstone and Hoxsey both went up for altitude records. Their speeds were about 38 miles per hour but, on reaching the higher and steadier currents, the wind increased so that they were blown backward gradually. Johnstone at 8500 feet must have been going 40 miles per hour, yet he was blown 45 miles away. Hoxsey went up 6900 feet and landed 25 miles to leeward. Both descended in safety about the same time that a nasty wind squall passed over Belmont Park and made everybody seek shelter. Both of these daring men flew back to the aviation grounds on the following day.

Although the Wright biplane scored its supremacy in altitude

flights at Belmont Park, Drexel in his 50 h. p. Bleriot monoplane, during a struggle of over an hour, succeeded in reaching 8373 feet. He has since at Philadelphia, scored an altitude officially recorded as 9897 feet, which, though higher than Johnstone, is not officially recorded as the highest record, for the reason that it does not exceed the last highest by 100 meters or 328 feet. This is one of the rules governing such contests. It is difficult to measure these high altitudes by triangulation, owing to the frequent disappearance of the aviator in the clouds or above the haze. The barograph, which is simply a small aneroid barometer with a pencil attached to the end of a lever recording on a graduated roll of paper set in motion by clock mechanism, has come to be regarded as the most reliable measuring instrument for altitude flights. It is officially sealed before using and officially opened afterward, but it is apparent that measurements above 9000 feet are so delicately recorded that errors of a few hundred feet may be easily made. This is indicated by the fact that one official measurement of Drexel's last record was announced as 9450 feet only.*

It was noticeable that several of the aviators wore eye glasses, normally, and that during flights most of them wore goggles. Moisant, who does not use goggles always, stated, after landing from his cross-country flight to Garden City, that his eyes were so blinded during the trip that he could scarcely see to make a landing. This was caused by the strong back blast of the propeller in front of him throwing into his eyes much moisture collected from the fog and much oil from the revolving engine. Under the circumstances, goggles would have been entirely useless. There is a simple remedy for this inconvenience and I note that some of the newer designs of foreign aeroplanes take advantage of it. A vertical wind shield before the face, rising to a height just sufficient to enable one to see over it, will throw the wind blast up over the head and leave sufficient calm before the face and eyes to enable one to light a cigar at the highest speed. The front edges and curves of the wings or planes of aircraft are shaped to take advantage of this phenomena by adapting them to rise into the partial vacuum thus created and so to increase their lifting power.

* The press of December 10, 1910, states that M. Legagneux, at Pau, attained an altitude of 10,499 feet in a Bleriot monoplane.

THE DEMOISELLE MACHINES AND SOME NOTES ON DESIGN.

I watched the perfomances of the Santos-Dumont "Demoiselles" at Belmont Park with much interest because of the low center of gravity of this type. They resembled winged tricycles more than aeroplanes, and their flights were always spectacular.

Messieurs Garros and Andemars seemed to control them readily but, although making considerable speed with their 30 h. p. motors, their small 18-foot spread of wings and only 100 square feet of supporting surface, they always flew low and seldom remained long in flight. It is said that M. Garros is not satisfied with the performances of his motor, which is one of the horizontal opposed cylinder type, and that he intends to adopt a Gnôme motor of the same power. It will be interesting to note the effect of this change, but it seems to be the opinion of experienced aviators that the low position of the driver in this machine, although it enables him to get a fine view of the landscape, not only detracts from the speed but makes the flight more difficult to control.

The low center of gravity in the Demoiselle type was the nearest approach to automatic stability exhibited by any of the aeroplanes at these meets. Gyroscopes, pendulums and empirical electric and compressed air devices were notably absent from all designs exhibited. It would be absurd to predict what may yet be accomplished in the direction of automatic stability, but it is notable that the most advanced manufacturers of aeroplanes still rely mainly upon the skill of the aviator for preserving stability or balance in the air.

According to Mr. Moisant, the work of controlling an aeroplane is very easy after it is well clear of the wind billows or waves which, near the earth, are often balloting around and flowing down over the various obstacles on the earth's surfaces. He says "any one except the timid man can learn to fly." It is questionable whether it is desirable to so perfect the aeroplanes that the timid can learn to fly, but this is not necessary in order to make use of them in warfare. Moisant agrees with other aviators in stating that velocity is one of the chief preventives against lateral capsizing. Should a strong current of air lift one side, say the right wing, equilibrium can be restored by a quick dive and a sharp turn of the aeroplane to the right by means of the vertical

rudder alone. Experienced aviators frequently right their machines in this way, without warping the wings or using the ailerons.

Mr. Moisant seems also to have positive ideas about the developments of the future. He thinks that the greatest advances will be made as an accompaniment to increased speed, high speed being a better preserver of equilibrium than flexible wing tips and other special devices, and he has been doing something in France towards the development of a high speed monoplane constructed wholly of metal, including the wings, in which he claims to have made two trial flights.

Mr. J. D. Pursell, a writer in *Aeronautics*, shows very good reasons why great improvement in speed may be expected, without further improvement or increase in the power of motors, by certain improvements in the arrangement of the lifting or plane surfaces and he predicts that it may yet be possible to run at comparatively slow speeds and at the same time have a reserve of power for high speeds with the same plane surfaces. This, of course, would be a wonderful step in advance.

DISTANCE FLIGHTS.

There were no special prizes for long distance flights at either of these meets, but in the totalization of distances at Belmont Park (the sum of the various hourly distance contests, which occurred each day) Latham won first prize in his 50 h. p. Antoinette, having covered a distance of 168 miles. The record for the longest distance yet recorded is held by M. Maurice Tabuteau, who made 289 miles in a biplane on October 28, 1910, at the Aerodrome Etampes, France, during a continuous flight of six hours.

PASSENGER CARRYING.

In the passenger carrying contest at Belmont Park (the greatest live weight carried over three miles), De Lesseps won first prize by carrying 356½ pounds the required distance in 5 minutes, 12 seconds.

In connection with the subject of passenger carrying, it is worth noting that aeroplanes for the navy should be constructed for carrying at least two persons, an operator and an observer, the latter being also a wireless expert. And in pursuance of this

idea it is of special interest to record here a notable event in the history of aviation, the sending of the first wireless message by Mr. J. B. McCurdy, on August 27, 1910, from his Curtiss biplane, during a flight over Sheepshead Bay. Mr. McCurdy describes the details as follows: "The telegraphic key was fastened to my steering wheel and was easily operated. For a ground from the machine I used a wire about 50 feet long, which, after I got well into the air, was thrown overboard and allowed to dangle behind the machine, with one end fastened to the apparatus. The antenna consisted of the guy wiring of the aeroplane so that the whole system was very simple. I flew away for a distance of about two miles and circled at an elevation of about 700 feet. Within this distance the instrument worked extremely well."

The message of 17 words was received by Mr. H. M. Horton, stationed on top of the grandstand of the race track. Since then Mr. McCurdy, at Hammondsport, N. Y., has sent numerous messages to Mr. Horton which were received at a distance of five miles.

ELY'S FLIGHT FROM THE U. S. S. BIRMINGHAM.

On November 9, 1910, the U. S. S. *Birmingham* being available for an experiment intended to demonstrate the practical requirements necessary for the use of existing aeroplanes from naval vessels in scouting, that ship was sent to Norfolk, where at the navy yard, a temporary wooden platform was erected on the forecastle, under the supervision of Naval Constructor Wm. McEntee, U. S. N. This platform was 83 feet in length, 24 feet wide, and built with an even slope of 5°, so that its forward edge was 37 feet above water.

Mr. Eugene Ely, then engaged at the Halethorpe meet, volunteered to make an attempt to leave this platform in a Curtiss biplane after the close of that meet which occurred on Saturday, November 12th. Ely's own favorite 4-cylinder motor was sent to Norfolk that night, from Baltimore, and on Sunday a Curtiss biplane, the same "Hudson Flyer" in which Mr. Curtiss had flown from Albany to New York, was transported to the navy yard. On Monday morning, November 14th, this aeroplane was placed on the *Birmingham's* temporary platform and it was noted then that the running distance, from the front wheel to the edge of the platform, was 57 feet. The motor was then mounted and, without

any previous tuning up or test of the reassembled aeroplane having been made on shore, the ship steamed to Hampton Roads, followed by the torpedo destroyers *Roe, Terry, Stringham* and *Bailey*.

The weather was unsettled, with low clouds and occasional light showers of rain and hail, but the wind from S. S. W. was not blowing more than 10 miles per hour.

Wireless telegraphic reports, however, indicated a change to strong northerly winds for the following day, and it was determined to proceed with the experiment that day, in the rain if necessary.

The original intention was to steam out into Chesapeake Bay, head the ship to the wind at about 10 knots and thus attempt a flight up the Elizabeth River to the Norfolk Navy Yard, with the torpedo boats stationed along the route in attendance. But the thickness of the weather rendered landmarks so obscure, that the ship was anchored off Old Point Comfort to await a possible improvement. Once, the torpedo boats were sent out and the ship got under way to begin operations, but an extra heavy fall of rain came on and proceedings were delayed. At about 3 p. m., another attempt was decided upon and, while getting under way, Mr. Ely took his seat in the biplane to test the motor. As his engine was gradually spun up to full speed, the powerful back draft from the propeller so disconcerted the helmsman on the bridge, his face being directly behind that propeller, that it was doubtful whether he would be able to steer the ship from that position. Suddenly, while 20 fathoms of chain were still out, and without previous warning, Mr. Ely gave the signal to let go and at 3.16 p. m., he quickly flew off the platform without having any assistance from the ship whatever in the matter of speed, or lifting power. He had realized that weather conditions would not improve, and had suddenly concluded to try the experiment from a standstill.

His aeroplane followed accurately the middle line mark on the platform, and its tail cleared the forward end by about 20 feet, before he gave it a graceful, bird-like swoop or vol plane (to increase the speed) and then he gradually arose to a height variously estimated at 150 to 500 feet. In thus swooping down, the lower part of his machine, the skid framing and the pontoons, struck the water and was sufficiently submerged to demonstrate that if

his speed had not already been accelerated to more than sufficient for flight, the retardation caused by the plunge would have prevented further flight. He explained later that his touching the water was entirely due to a miscalculation in moving the rod of the front control or elevator. His rod had been lengthened, since his previous use of it, to suit another aviator, and when he pulled it towards him to raise the elevator he did not give quite enough angle to the planes to prevent too deep a dive. On striking the water, the propeller tips struck also and both driving edges were splintered. This did not apparently affect the control or the speed of the aeroplane, and it demonstrated that such a propeller may be considerably damaged without affecting a flight seriously.

A quantity of salt water was splashed up over his goggles, and this, combined with the continued rain, rendered very obscure his view of the necessary landmarks, that were further obscured by the thick weather. He accordingly became confused in his bearings, and after about four minutes in flight, seeing the broad beach on the north side of Willoughby Spit spread out invitingly under him, he decided to land there. This he did, in the soft sand, without any damage to the aeroplane, after a flight of 2½ miles. I was pleased to learn that he had not continued on towards Norfolk, as I had begun to have grave doubts about his ability to get his bearings in thick weather, over a landscape with which he was unfamiliar. After he had demonstrated his ability to leave the ship so readily, without assistance from the ship's speed, or from any special starting device, such as that formerly used by the Wright brothers, my satisfaction with the results of the experiment was increased, for two reasons:

(1). The point of greatest concern in my mind about carrying out the original program was the uncertainty of stopping the ship or changing the course in time to prevent running over the aviator in case he should land in the water.

(2) His demonstration, that an aeroplane of comparatively old design and moderate power can leave a ship in flight while the ship is not under way, points clearly to the conclusion that the proper place for the platform is aft. An after platform can be made longer, will not require a loosening of the stays of any mast, and its essential supports can be so rigged as a part of the permanent structure of a scout cruiser as to cause no inconvenience in arranging the other military essentials of the ship's design.

CURTISS' AEROPLANE BEING ASSEMBLED ON TEMPORARY PLATFORM ON BOARD THE U. S. S. "BIRMINGHAM," NOV. 14, 1910.

U. S. S. "BIRMINGHAM" WITH CURTISS' AEROPLANE ON TEMPORARY PLATFORM READY FOR A FLIGHT, NOV. 14, 1910.

MR. EUGENE ELY IN FLIGHT FROM U. S. S. "BIRMINGHAM," NOV. 14, 1910

This information amply repays for the small expense of rigging the experimental platform. Furthermore, if it be desired to have an aeroplane land on board of the ship the after position of the platform is the best for that purpose. It would be comparatively easy, in smooth water, for a scout to steam head to wind at the proper speed to allow of the gradual approach and descent of an aeroplane to a platform located aft. Safety nets at each side of a middle runway could easily be rigged. If the condition of the wind and sea should render such a landing inadvisable, the aviator could land in the water under the lee of the ship and be picked up by a boat's crew. The machine used by Mr. Ely on this occasion was supplied with two cylindrical air chambers called "pontoons," under the lower planes, to impart the necessary buoyancy, and the aviator himself was equipped with a pneumatic life-preserver.

Photographs of Ely's start, the temporary platform and the machine used are appended.

THE AEROPLANES AND THE AVIATORS.

Details of the machines used at Belmont Park, and the names of the aviators using them, as published by the official starter of the meet, will be appended to this report in tabular form. These details will cover also all the aeroplanes used at Halethorpe.

In this country there are already numerous biplanes and some monoplanes and triplanes, other than those tabulated in the appendix, each with distinguishing characteristics, that have made successful flights. It is to be hoped that an exhibition will soon be given in this country equal to that which opened in Paris on October 15, 1910.

At this Paris Exhibition, improvements were shown in the Farman and Voisin biplanes and many improvements and novel features in both biplanes and monoplanes of other makes. Most of the best known makes and many new designs were represented. The following list of the important exhibitors or companies showing full-sized, ready-to-fly, aeroplanes on exhibition illustrates the advance made by France in this industry. Louis Paulhan, the Nieuport, the Esnault-Pelterie, the Ferdinand Loire, [illegible]urcat-Mery et Rougier, Ardineau & Co., the Goupy, Régy [illegible]es, the Compagnie Aerienne, the Avia, Louis Bregnet, the [illegible] I. N. A. (Compagnie Internationale de Navigation Aerienne),

the Chantiers Tellier, Paul Koechlin, Clerget & Co., Henry Coanda, Henri Fabre, Passerat & Radiguet, the Antoinette, Roger Sommer, G. Vinet, Sloan and Co., the Hanriot and P. J. Gregone.

The most original departures from familiar makes at this exhibition were the biplane of L. Paulhan, the hydro-aeroplane of Henri Fabre and the biplane of Henry Coanda. Paulhan's machine includes certain features patented by Henri Fabre, with whôm he has been collaborating. It bears little resemblance to any previous machine, the elevator is slung on leather straps and works by the bending of these straps, the long skids are linked up to the main frame members by an intermediate strut of wood, also attached by leather straps at each end, and the tail is also attached by leather. The main frames of the structure that do duty for the forward edges of the planes, elevator, rudder and tail, are made up like bridge trusses of a series of endless V's. They are composed of two long flat planks separated by short struts of the same width as the planks, and held in position by angle plates and copper rivets. Instead of warping the wings or using ailerons, the whole angle of incidence of the wings is altered. Mr. Paulhan believes that this V method of constructing the main members of the planes is lighter and stronger than any other, and that the passage of the air through the dihedral, or truss arrangement makes for lateral stability. The plane surfaces are simply hooked on to these spars and supported rearward by flexible ribs which fit into pockets in the fabric. These ribs can thus be easily replaced when broken. This machine has other novel points, in details, and is said to have flown quite satisfactorily, even in its experimental stage.

The hydro-aeroplane of Henri Fabre shows the same dihedral bridge trussing of the front edge spars as Mr. Paulhan's biplane. It has two tandem planes with the small plane leading and a small elevator over the top of the forward plane. Each of the main or after wings has a mast about one-third of its length from the body and at the foot of each mast is a float. The front planes also have a float under the mast which carries them both. While on the water the structure is thus supported at three points. Mr. Fabre has, on many occasions, risen from the water and made flights of six to nine miles over the mouth of the Rhone and he has found by experience that no vertical rudder is necessary, for

the dihedral, or truss, frames act effectively as rudders, the whole front plane being swung around its mast horizontally.

The Coanda machine is a clean-cut model without superfluous air-resisting parts. Its chief novelties consist of wood being used entirely in the wing or plane construction and in the replacement of the usual propeller by a turbine fitted in the bow.

An Etrich monoplane, by an Austrian engineer of that name, was expected at the Belmont Park tournament but failed to arrive. This has several very novel features of control and construction, including a bridge-truss arrangement for supporting the wings, and has met with considerable success in flight.

There are several new types that have made successful flights in England, a very notable one being a peculiar biplane by Lieut. J. W. Dunne, with the planes sloping aft on each side of a boat-shaped body or chassis. This is said to be a step towards improvement in stability.

An interesting and novel idea is that of a Japanese officer whose machine, with a double set of wings is patterned after the dragon fly. With this he claims ability to hover over an object after the manner of that insect.

EXTENT OF AVIATION INFORMATION AND LITERATURE.

The world's progress in aviation is being watched with such interest that a great many readers of the newspapers who have not time to read the vast volume of existing literature bearing upon the scientific and practical investigation of this subject, feel competent to discuss the achievements of the aviators and to improve upon the designs of aeroplanes. The Wright brothers are commonly regarded as having made their discoveries in a haphazard though practical way. Fact is, their success is due to a careful analysis of all previous information and a most painstaking investigation conducted by purely scientific methods supplemented by frequent tentative experiments.

Aviation as an art is such a fascinating study and experimentation with models and gliders is so easy that thousands of people in all parts of the civilized world, youths, men and even women, rich and poor, are devoting a large share of time and money to it.

There are over 50 aeronautical societies and influential bodies in the world studying earnestly to advance the art and add to the science of aviation. Patents on the subjects are increasing at an

alarming rate, the spirit of competition is keen and, I regret to say, jealousy among aviators as well as among designers is already apparent, although aviation has not yet produced successful machines for traffic or commercial use. It is very probable, however, that certain manufacturers of aeroplanes, particularly those in which the industry is an adjunct to an establishment for the production of lightweight motors, are making a commercial success of aviation. This is due principally to its success as a sport and to its promises of usefulness in warfare.

Many writers on aviation are predicting all sorts of dire disaster to battleships from aerial warfare, with much of the same sort of enthusiasm and abandon as actuated the early prophets of torpedo warfare, but conservative writers believe that it is yet too early to forecast the full development of aerial warfare, although they admit that it will play an important part in future wars.

It may be assumed, however, that the present state of development will limit the use of aeroplanes, in the navies of the immediate future, to reconnaissance or scouting duty.

The extent of existing literature on aeronautics and aviation is not generally known. There are already more than 400 books on the subject; many of them large standard works, and over 25 current publications. Many people are actively engaged in writing and compiling other books to keep the literature up to date. I have endeavored in this report to jot down the salient features only of my observations and to avoid mention of what is commonly known. There should, however, be collected, at the Navy Department, a library of the most important standard works and current literature on the subject of aviation, for the benefit of those who may be specially detailed to thoroughly investigate the development of aviation in the navy.

THE DEVELOPMENT OF AVIATION IN THE NAVY.

The development of air craft bears close analogy to the development of boats both scientifically and practically. The equations of motion in both air and water are similar and the dynamical properties of both elements are very much alike, so that the data obtained from model experiments in water may with slight variations be used for compilations in the design of aeroplanes. Already the lines and architecture of an aeroplane can be worked out as readily as those of a racing yacht.

The boats of the navy are provided by the joint action of the Bureaus of Construction and Repair and Steam Engineering, and the engineering problems involved in the construction of aeroplanes deserve consideration by the skilled talent of both bureaus. The design of the motive power, however, occupies a more important place in the problems of aeroplane construction than it does in the construction of boats. Failure of the motive power in a boat is insignificant in comparison with a like failure in an aeroplane and it is principally due to improvements in motive power that the use of aeroplanes has been made practicable. Lightness combined with strength and reliability is of paramount importance in the aeroplane work that naturally pertains to both bureaus. The structural work of the frames, planes and control mechanisms calls for special skill such as that displayed in the shops of eminent boat builders, but the work involved in the design of aeroplanes depends to a greater extent, than in the development of boats, upon the practical experiences of the men who will use them and, for this reason, the Bureau of Navigation is also especially concerned in the work of development. The Bureau of Ordnance is also concerned with the development of ordnance material for defensive use in aerial warfare.

The Navy Department is already fairly well equipped with a model plant at the Washington Navy Yard for the scientific investigation of problems connected with the design and construction of aeroplanes and with an experiment station at Annapolis for investigating the problems of motive power and for testing.

In view of the above, it seems that the organization of the Navy Department is well equipped for taking up the study of aviation and the development of aeroplanes for naval purposes and that a safe guide in the assignment of cognizance is to place the design, supply, installation, maintenance, repair and use of aeroplanes in parallel with that of boats for the navy.

The boats of the navy that are provided with steam or other mechanical power cost from $1635 (for the 28-foot motor whale boat), to $25,037 (for the 50-foot steam cutter); the cost of the motive power being from 50 to 59 per cent of the total.

Aeroplanes of proven types are now advertised in this country for from $1675 to $10,000, the cost of the motive power being about 50 per cent of the total.

It is, therefore, recommended that aeroplanes in the navy be placed in the same category as boats and be acquired, in like manner, as equipage.

Whatever may be the results obtained from the future development of aeroplanes for use on land, a type or types, specially adapted to the naval service is yet to be developed. For this reason, I recommend the immediate purchase of only such of the existing aeroplanes as are needed for the tentative and progressive instruction of our personnel in their use. It is also recommended that the sum of $25,000 be authorized by Congress for experimental investigation of the practical problems to be presented during the progress of instruction and in the establishment of special facilities for carrying on such work in a systematic way.

We are fortunate in being able to rely, to a certain extent, upon the U. S. Aeronautical Reserve for trained aviators, many of them equipped with aeroplanes, to expand our resources in emergency, but it would be folly to depend entirely upon this source and our aim should be to so master the subject of aviation within the service that we may advance the science from a nautical standpoint and so assist these experts to a correct understanding of the conditions and problems which are of special importance to the navy.

For a beginning, I recommend that the Department assign two aeroplanes, or at least one two seated aeroplane (with necessary spare parts) as part of the equipment of each scout cruiser. It would probably be advantageous to obtain one of each of the most advanced types made in this country to begin with, although Mr. Glenn Curtiss has already made some independent experiments with aeroplanes fitted to rise from and land on the surface of the water, but such considerations as this should be left for recommendation by a special body of officers, detailed to study the subject, from the bureaus having cognizance.

TRAINING OF THE PERSONNEL.

The training of qualified aviators in the navy should be advanced simultaneously with an extension of our training to use wireless telegraph from aeroplanes, to the end that, if possible, each aeroplane used from a ship may carry an aviator and an observer, both qualified to control the machine.

Aeroplanes have already been developed abroad with this object in view, the two seats being each provided with control apparatus enabling each man to alternate in control. All aeroplanes used for instruction in France are two seated and monoplanes, as well as biplanes, have been produced which can carry two passengers in addition to the pilot.

There are numerous aviation schools in Europe, each provided with suitable practice fields or "aerodromes," and it is estimated that about 300 pupils have already qualified in the commercial aerodromes alone. At least two fields suitable for this purpose, controlled by the Navy Department, already exist on the Atlantic Coast, one adjacent to the Experimental Station at Annapolis (suitable for summer work); the other at the Navy Yard, Charleston, S. C. (suitable for winter work). Each place would probably require a moderate amount of surfacing and the construction of sheds or hangars. On the Pacific Coast, it is probable that suitable facilities could be found near the coaling plant at San Diego, Cal., and this would be convenient to the aerodrome of Mr. Glenn Curtiss at that place.

There are many ways in which *preliminary instruction* can be carried on without danger and without much expense in repairing damaged machines. French aerodromes are variously equipped with specially prepared machines for the use of pupils. The Voisin Company, for example, has an aeroplane closely resembling its ordinary product but with the power and the angle of incidence of the planes so capable of adjustment that it is impossible for even an expert to rise very high or to remain in the air for many minutes. The Clement-Bayard Company and the Antoinette makers each use aeroplanes without wings, or planes, for the instruction of beginners and such devices are suitable for use at any place where there is not sufficient space available for a large aerodrome. A practice machine, costing from $100 to $200, with about 100 square feet of plane surface suitably disposed in connection with a motor cycle, driving an air propeller, either on land or mounted in a suitable boat, would provide an excellent means for learning the rudiments of flying. But these are also details which should be left to those organized to advise the Department on the subject.

The systematic training of naval aviators may be readily inaugurated with the aid of the torpedo flotillas, or possibly of

torpedo boats in reserve, by stationing one or more boats at a time, temporarily, in succession, at or near each of the practice fields, the boats being used as headquarters, or bases for instructional work.

The further needs of the service for carrying on this instructional work could thus be easily and practically developed. But, *prior to this* and while the first aeroplanes are being procured, at least one officer should be sent, for instruction, to each of the established aerodromes in this country. The California aerodrome of Mr. Glenn Curtiss is probably the best at present and is eminently suitable for instruction during the winter months.

One of the earliest steps recommended, is the establishment of an *Office of Naval Aeronautics* in the Department, and the detailing of a representative from each of the Bureaus of Construction and Repair, Steam Engineering, Navigation, and Ordnance to study the subject of aviation and to recommend the measures to be taken, from time to time, for its development in the navy.

These officers should constitute a council or board to meet at the office of Naval Aeronautics, whenever required to consider recommendations and whenever necessary to consult the literature, which should there be collected, or to discuss the many questions involved.

A library of standard aeronautical works, current aeronautical literature, small models, plans and all available information on the subject should be systematically collected at this office and kept up to date under the directions of the senior officer detailed to preside and to attend to the correspondence.

ADDITIONAL NOTES ON AVIATION.

The compass used by J. B. Moisant, mentioned in the preceeding report, has been frequently represented by him as "a glycerine floated compass." I presume glycerine renders the needle less sensitive to vibration.

A compass specially designed for aerial navigation, designed by M. G. Deloz, is described in *L'Aerophile* for December 1, 1910. This is similar to the usual mariner's compass in everything pertaining to the suspension or balance and the provisions against oscillation and vibration, but the bottom of the bowl is of glass for the purpose of enabling the aviator to see through it. The compass needle is suspended beneath a disc of mica or other trans-

parent substance. Upon this mica disc is engraved a series of parallel lines, with occasional cross lines, and it may be turned in azimuth, through the medium of a milled head button above the compass face, without disturbing the needle. The parallel lines may thus be pointed in any given direction and the mica disc again allowed to settle upon the needle in such a way that it follows the needle in its movements.

We can readily see how this compass would be of service in following a charted course over a visible landscape, but to adapt it for navigation over the sea some modification may be necessary. It is possible that a mirror attachment may be made to reflect the image of the base ship upon the compass dial and so assist in maintaining a correct course.

In connection with the subject of overwater flights the following official account of J. A. W. McCurdy's record flight across the Florida Straits is interesting:

EXTRACT FROM REPORT OF THE COMMANDER OF EIGHTH DIVISION, ATLANTIC TORPEDO FLEET.

In safeguarding such a flight many conditions had to be considered. (a) The sea could not be rough if the aeroplane was to be saved in case of alighting in the water. (b) The vessels must always be close enough together in order that the aeroplane could always be in sight of at least one vessel; Mr. McCurdy stated that the visibility of his machine was about five miles, so ten miles was taken as the proper distance between stations. (c) The aviator must be provided with a buoyant and yet light life preserver. Captain W. I. Chambers, U. S. Navy, sent to me a pneumatic life preserver for this purpose which was worn by Mr. McCurdy. (d) In case of thick weather shutting out a view of the sea and the destroyers it became necessary to provide a means of steering a course. This was arranged by using a small navy boat compass, attaching it to the frame of the aeroplane below the aviator's seat. In order to make sure of its accuracy the machine was swung around after installing the compass and by means of reciprocal bearings on another compass about 30 feet away, it was found the mounted compass was nearly magnetic.

At the suggestions of Mr. McCurdy a platform with a hinged tail was rigged on the stern of the *Paulding*, the idea being in case of alighting in the water to haul the aeroplane up on this platform and allow him to attempt a second flight. The material of this platform was furnished by the Curtiss Company and built by the men of the destroyers.

The 24th was selected as the earliest day possible to make the flight. On the 24th, however, a very strong northeast wind was blowing and the sea in the Straits was too high for safety in case of alighting. The weather condition was watched very carefully both at Key West and Havana, and the commandant at Key West arranged that these reports

should be collected at the wireless station every four hours and copies delivered to the *Paulding*. There was no break in the weather, the barometer remaining high, until Saturday, January 28, 1911, when at Key West the wind seemed to have lulled, and Havana reported but little wind. The four destroyers left Key West at 3.30 a. m. and proceeded to a point 40 miles south by west of Sand Key light. It was soon seen that the conditions were unfavorable and that a flight would be extremely hazardous in case the aviator was forced to alight. This opinion was sent to the commandant at Key West and telephoned to Mr. McCurdy, who at once agreed to abide by advice of the commanding officers of the destroyers. The *Terry* and *Drayton* were then sent into Key West and the *Paulding* and *Roe* proceeded to Havana. We visited the Belen Observatory kept by Jesuit fathers, and Father Anguati informed us that there would be no change in the conditions until the two anti-cyclones had passed. He explained that the spell of weather had been long due to the passage of one anti-cyclone after another, and that if a low appeared the conditions would become better at once. I notified Mr. McCurdy of this through the commandant at Key West, and Mr. McCurdy sent definite word that there would be no attempt to fly until Monday at the earliest.

On Sunday afternoon the wind seemed to drop and the sea on the Malecon at Havana, which had been large all the week, was seen to be lessening. We visited Belen Observatory Sunday night and were told that the barometer was falling, that the next day would be calm, and advised that opportunity be taken of it. A wire was at once sent to the commandant at Key West of the expected conditions and Mr. McCurdy notified that the next day, Monday, January 30, 1911, would probably offer the conditions sought.

The four destroyers made a rendezvous at 6.00 a. m., 90th meridian time, at a point 30 miles south by west one-half west of Sand Key light. It was seen that the wind would be of small force and there was but little sea, only the natural swell of the ocean. All agreed that we could not let an opportunity go by, even though the following day might see the ocean smoother. The *Roe* was told to wireless to the commandant at Key West to notify Mr. McCurdy that the conditions were good, that we advised a start be made, and that the destroyers were taking station.

At 6.30 a. m., 90th meridian time, all vessels safeguarding the route to be taken were at their stations. The lighthouse tender *Mangrove* was five miles from Sand Key, the revenue cutter *Forward* ten miles from Sand Key, and the destroyers spaced at intervals of ten miles from the *Forward*, on the line between Sand Key and Morro lighthouse. At 6.30 a. m., meridian time, the *Roe* reported by wireless to Key West that all vessels were ready. A light air had sprung up from the southeast.

At 7.22 a. m., 90th meridian time, Mr. McCurdy launched his aeroplane into the air, and at 7.34 a. m. he passed the Key West wireless station at a height of something under 700 feet. This news was wirelessed from Key West and received by all destroyers. The commandant at Key West ordered hoisted a large flag at a wireless mast which was hauled down as the aeroplane passed, a signal to the tug and steam launch patrolling be-

tween the city and Sand Key light to watch for the aeroplane. At 8.11 a. m. the *Roe* wirelessed that the aeroplane had passed over her and all destroyers at once steamed with all possible speed with three boilers or about 26½ knots speed, for Havana. From the time of passing the *Roe* no other message could be received, as the *Roe* only could send by wireless. The aviator successfully passed over the *Drayton* at 8.55 a. m., 90th meridian time, and *Terry* at 9.17 a. m., and at 9.15 a. m., 90th meridian time, was in sight of the *Paulding*. At 9.17 a. m. the *Terry* hauled down her flag hoisted as a signal that he had passed over her. At 9.33 a. m. the aeroplane descended slowly and was seen to alight on the water. The *Paulding* at this time was about seven nautical miles from Morro and about eight to nine miles from the *Terry*. The *Paulding* turned and steamed back to where the aviator had alighted. It took exactly 12 minutes after the turn to reach the *Terry*, which had stopped close to the machine and had rescued the aviator, so that the aeroplane alighted about five miles to the northward of the *Paulding*, making twelve miles from Morro. When the *Paulding* arrived at the scene Mr. McCurdy was sitting in the *Terry's* lifeboat, directing where to make lines fast to the aeroplane.

It was found impossible to use the hinged platform to run up the machine and after considerable difficulty, owing to the swell and the frailness of the aeroplane, we succeeded in skidding it up the vertical side of the ship and landed it on deck. The cause of alighting was believed at first to have been due to a hole in the engine crank case allowing the oil to run out, but, afterwards, it was discovered that this hole was the effect and not the cause. The lubricating oil gave out about the time the aeroplane passed the *Terry*, and in the next 10 minutes before he alighted, at 9.33 a. m., all of the engine bearings had burned up. There was nothing to do but alight, and the manner in which he did so showed the possibilities of the use of aeroplanes over water. If the sea had been rough, undoubtedly Mr. McCurdy would have been thrown from his seat, but on this day there was no such danger, and he said he did not even get wet. The machine did not float upright; the engine was submerged and the front horizontal steering planes elevated in the air, the tail steering planes were broken in alighting. It would have been impossible to again fly this machine until thoroughly overhauled at the factory. Other damage was done to the aeroplane by the boats and in getting it on board the *Paulding* but all of a minor nature.

When the *Roe* arrived about 10.15 a. m., a message was sent by her to notify Captain Hayden that the aviator had alighted 12 nautical miles from Morro and was safe. The Cuban gunboat *Hatuey* appeared at 10.30 a. m., with President Gomez on board and offered congratulations to Mr. McCurdy and asked if she could be of service. The message was received by the *Roe* and thanks were sent back by wireless to the President of Cuba.

At 11.45 a. m., the *Paulding*, with Mr. McCurdy on board, and in company with the *Terry*, *Roe* and *Drayton*, steamed for Havana harbor, arriving at the entrance at 12.22 p. m. Great crowds of people could be seen everywhere; on the Malecon, on Morro, and on the housetops; they

gave Mr. McCurdy an ovation as the *Paulding* steamed close by and they could see the aviator on the bridge. All four vessels moored at buoy No. 2 in the harbor of Havana.

Mr. McCurdy decided, as he had but one aeroplane in good condition and must use that every day at the meet at Camp Columbia, to defer his trial of flying from the platform on the *Paulding*. He expressed a hope of being able to make the flight from Key West again. It is the opinion of the officers of the destroyers, that Mr. McCurdy's covering only 90 of the 106 statute miles between Key West and Morro in no way detracted from the wonderful exhibition of nerve and daring displayed by him, and to alight in the ocean, as he did, unhurt, and his machine only slightly damaged, was even more wonderful than if he had safely landed at Camp Columbia, and further, the fact that Mr. McCurdy could and did steer a compass course is of great advantage to the future progress of flights across water. Captain R. E. Hayden, commandant of the naval station at Key West, planned and executed the methods of wirelessing information and safeguarding the aeroplane until the *Roe*, the first destroyer, could be reached.

The delightful personality of Mr. McCurdy made the ready co-operation of every one in Key West and on board the ships a foregone conclusion, and that he did not complete his journey was as great a disappointment to the officers of the destroyers as it was to Mr. McCurdy himself.

Thanks are due to the interest displayed by the weather bureaus both at Key West and at Havana, particularly to the Jesuit Fathers at Belen Observatory.

(Signed) YATES STIRLING, JR.

Civil Engineer F. O. Maxson, U. S. N., by careful triangulation, observed the altitude of McCurdy, as he passed over a point 44 feet distant from the northwest wireless mast at Key West, to be 684 feet above ground and 691 feet above sea level.

FROM REPORT OF COMMANDING OFFICER U. S. S. "TERRY."

This vessel left the dock at Key West naval station about 3.30 a. m., 75th meridian time, on January 30, 1911, and in company with the U. S. S. *Drayton* made a rendezvous with the U. S. S. *Paulding* and U. S. S. *Roe* at 6.40 a. m., at a point midway between Sand Key light and Morro Castle, Havana. At this point the *Terry* was stationed for the flight and kept position by the *Drayton*, bearing N. by E. ½ E. magnetic.

At 7.30 received wireless message that aviator had started from Key West, and at 8.23 that he had passed the U. S. S. *Roe*. At 8.23 went ahead on course S. by W. ½ W., magnetic, at 24 knots. At 8.38 sighted aeroplane apparently astern of *Drayton*.

At 9.17 the aeroplane passed directly over the *Terry* at a height of about 700 feet. The aeroplane deviated slightly to the right of the course after passing the *Terry*, but his bearing was constantly kept with pelorus.

After the aeroplane passed the ship speed was increased to about 26½ knots.

At 9.32 the aeroplane was observed to glide quickly toward the water, and at 9.33 it alighted on the water, with a splash, about three miles away. The ship was immediately headed for the point of fall by compass and at a speed of about 30 knots.

The machine could not be seen on the water at first, but after about three minutes' run it was sighted directly ahead, with the aviator safe, sitting on the machine and in the water about to his waist.

The pontoons of the machine were entirely submerged, and it seemed to me that the machine's only reserve buoyancy was in the bamboo parts and the gasoline tanks.

The vessel was backed full speed and stopped with the aeroplane about 30 yards abreast the foremast, at 9.40, and two life-boats, one in charge of Ensign N. L. Nichols and one in charge of Ensign C. C. Slayton, sent to his assistance. Mr. Slayton's boat rescued the aviator and both boats waited with the aeroplane to assist in getting it on board the *Paulding.*

It was very difficult for us to keep the machine in sight in the water, and in future over-water flights the aviator should carry a furled flag of considerable size to be hoisted in case of having to land in the water.

Ensigns Slayton and Nichols noticed many sharks in the water after the boats had gathered around the aeroplane.

M. E. TRENCH.

The following extracts are made from McCurdy's account of this flight:

As I left the sand wastes of the Florida Keys behind me I was amazed to find the sea confronting me instead of being below me. I beheld a mirage, not as seamen see this phenomenon, but as though I were part of it.

It was impossible at first to discern the boats that I knew were stationed below in the waters surrounding Key West, but before me, as in a vertical picture, appeared the smoke signals of the torpedo-boats that I knew were many miles beyond me.

Having had no experience with mirages, I could not depend upon this uncanny guide with certainty, and I, therefore, turned to the compass for assistance.

As the strength of the sun's rays increased, the mirage disappeared and I sighted the *Roe,* the first of the destroyers in the line of flight.

As I sailed over the destroyers I could plainly see the sailors at quarters and the white uniforms of the men stood out distinctly in the warm clear sunlight.

Soon I became accustomed to this and the sensation was glorious as I rushed forward at 50 miles per hour toward this wonderful panorama which then appeared to recede from me. It seemed no time before the Morro and Havana were in plain view.

Previous to McCurdy's flight across the Florida Straits, the best performance in flying wholly over or across water was that of Robert Loraine, the English actor-aviator, who on September 11,

1910, made a flight of 55 miles across the Irish Sea from Holyhead, falling to the water just before he reached the Irish coast.

Altitude Flights.—On December 9, 1910, M. Legagneaux, at Pau, France, attained an official height of 10,409 feet, in a Bleriot monoplane and on December 27, 1910, Arch. Hoxsey, at Los Angeles, Cal., in a Wright biplane, attained an altitude of 11,474 feet. Unfortunately, the barograph which recorded this flight was not immediately calibrated and was injured during the subsequent flight in which this brilliant aviator lost his life.

Distance Flights.—The French Michelin prize for distance, during 1910, was finally won by Tabuteau at Buc on December 30, 1910, at which time Legagneaux's latest record of 320 miles was exceeded. The official distance of this flight was recorded as 360 miles and the time 7 hours, 48 minutes. He used a Farman biplane fitted with a Renault motor.

Passenger Carrying.—M. Roger Sommer recently took up six passengers in a large biplane at Douzy, France, and, after circling the aerodrome at a height of 100 feet, flew to Rouilly and return, a world's record for cross country flight with passengers and total weight lifted.

Soon after this M. Le Martin, at Pau, made a new world's record when he took up seven passengers, in a monoplane, for a five-minute flight.

The longest cross-country flight yet recorded is that of Captain Bellanger, of the French Army Aviation Corps, who flew from Paris to Pau, a distance of 500 miles, during which a landing was made at Bordeaux and at other places to renew gasoline.

AEROPLANE WIRELESS TELEGRAPHY.

The following details of Mr. H. M. Horton's interesting aeroplane wireless plant are taken from his description in *Aeronautics* for January, 1911.

> The entire aviation set weighs but thirty pounds and consists of: First, the power plant, a small compact storage battery that has an actual ampere hour capacity of 60 and a voltage of 6; a high frequency coil that weighs but 12 pounds, a helix with two small condenser tubes mounted in parallel and the transmitting key.

After describing the disappointments of the first installations, he says:

> A way was finally worked out, however, to make all the stays on the machine, the engine, tanks, in fact all metal parts, act as part of the

oscillating system. The aviator's levers being connected thereto and uninsulated, and being firmly grasped in his hands, the oscillations were actually passing through his body each time the transmitter was operated, but inasmuch as the other side of the oscillating system was carefully insulated, he experienced no ill effects.

Our new receiver consists of a very small loose couple, a set of head telephones and the "Pericon," all nested in such manner that the entire set is but 4 x 4 inches and weighs but 3 pounds. In testing the new receiver the first morning it arrived, we were not a little pleased to pick up Buffalo Station, 142 miles distant, and with high mountains surrounding us on all sides.

So far our experiments have been successful beyond our expectations, clear and loud signals coming from the air station no matter where she has gone, and because of the strength of the signals that have been received from our air station over the distances which we have now tried, we are led to believe that a proper war machine, with the wireless apparatus built therein as an integral part, will be able to transmit to and receive intelligences from headquarters stations any distance the aeroplane scout would be liable to be sent in times of war.

Recent tests in wireless aeroplane telegraphy conducted during the Aviation Meet at San Francisco, Cal., resulted in unqualified success. The apparatus weighed 31 lbs., and although installed in five minutes only, worked efficiently at 40 miles. The messages were sent from the machine by Lieut. Beck, U. S. A., the director of the meet, and the whole test was conducted by the U. S. Signal Corps. This test disclosed the fact that it is possible to approximate the distances of aeroplanes by the use of the wireless apparatus.

M. Maurice Farman has also been experimenting with aeroplane wireless telegraphy at the Buc aerodrome. He has sent a message from his biplane a distance of six miles and anticipates greater success in future.

SHIP FLIGHTS.

In connection with Ely's flight from the *Birmingham*, recorded in my foregoing report, the following extract from an official report of that aviator's flight from the aviation field at San Francisco, Cal., to the U. S. S. *Pennsylvania* and return, on January 18, 1911, is interesting:

EXTRACT FROM THE REPORT OF THE COMMANDING OFFICER OF THE U. S. S. "PENNSYLVANIA," CAPTAIN C. F. POND, U. S. N.

A special platform had previously been erected on board at the Navy Yard, Mare Island, Cal., the construction of which is fully shown in the accompanying photographs. This platform, somewhat modified from the

one used by Mr. Ely in his flight from the U. S. S. *Birmingham* at Hampton Roads, Va., was 119 feet 4 inches in length, 31 feet 6 inches width in the clear, extending from the stern to the bridge-deck over the quarter-deck and after 8-inch turret, the forward end being 5 feet higher than the after end, and with a fantail of same width and 14 feet 3 inches in length sloping at an angle of about 30 degrees, over the stern. At the sides were fitted guard rails of 2-inch by 12-inch planking, and guide rails of 2-inch by 4-inch scantling, 12 feet apart, extended throughout its length. These guide rails, evidently intended to aid the aviator in determining his direction upon landing were of little or no use in that connection, but served a useful purpose in holding the lines connecting the sand bags at a proper height from the platform, though temporary blocks would have served equally as well. Every possible precaution was taken to insure the safety of the aviator. As fitted at the navy yard, the platform bore at its forward end a canvas screen extending from the platform to the temporary searchlight platform on the mainmast underneath the lower top, intended to catch the aviator and his machine should all other means fail, and, 10 feet from its forward end, a 2-inch by 12-inch plank extending across the face of the platform. These, and especially the plank, were very crude devices, and had they come into use would probably only have caused serious if not fatal injury to the aviator and his machine. Abaft the solid plank stop and spaced about 6 feet apart were fitted two canvas screens about 20 inches in height. These, together with the slight slope of the platform, were the only means provided in the original construction to check or stop the flight of the machine. It was very evident that something more was needed and after several consultations with Messrs. Curtiss and Ely, during which several schemes were considered and rejected, it was finally decided to adopt a system of sand bags such as had been successfully used to check automobiles at racing meets. Accordingly 22 pairs of bags were placed on the platform, each bag containing 50 pounds of sand, accurately weighed to insure uniformity of action, so as not to slue the machine, each pair being connected by a 21-thread line hauled taut across the face of the platform over the guide rails. These bags, spaced about 3 feet apart, covered about 75 feet of the length of the platform. As it turned out they were ample for the purpose and worked perfectly and none of the other devices were called into play. On either side of the platform, awnings were spread, extending to the life-boat davits, to catch the aviator should he be thrown over the edge of the platform. Life preservers were supplied and expert swimmers stationed, while boats lay off on either side for use in case of necessity.

The flying machine, a Curtiss biplane, had been fitted with a central skid, its lower face about 5 inches above the plane of the wheels on which the biplane stood when at rest, to which were attached three pairs of flat steel hooks intended to catch the lines connecting the sand bags. These hooks, though simple in design, were extremely ingenious. When in position, their points, which were about 4 inches in length and with 4-inch opening, lay in a horizontal plane parallel with the face of the skid and further precaution was taken to round the extreme points so that they might not

catch in the cracks of the platform. Their shanks were about 16 inches in length, and they were secured in pairs, one on either side of the skid, by a through bolt about 5 inches from the forward end of the shank. So fitted they hung point down to the rear and projecting about 4 inches below the lower face of the skid, further depression being prevented by a wire loop and the hooks made positive in action by a spiral spring at the forward end of the shank so that they might give upon hitting any undue obstruction such as might be encountered upon rising from the ground and would immediately automatically regain their proper position. It is only necessary to add that they functioned perfectly. The machine was further fitted with two metal air tanks, one on either side and with a hydroplane forward for use in case, through accident, the landing was made in the water. There were no other special fittings, and the machine landed on its rubber-tired wheels, as upon ordinary occasions. Ely himself wore a life preserver about his shoulders improvised from the inner tube of a bicycle tire.

The ship was riding to the flood tide with the wind, a light breeze of about 10 to 15 miles about three points on the starboard quarter, the most disadvantageous point, both accelerating the speed of the aeroplane and sweeping it off its course. The U. S. S. *Maryland* lay about 1000 yards, two points abaft our starboard beam, and the U. S. S. *West Virginia* about 500 yards on our port bow.

The flight from the aviation field at Tanforan, 10 miles distant in an air line, was made at a speed of about 60 miles an hour, as determined by the time of flight, and at an elevation of about 1500 feet. When about a half mile distant the aeroplane made a graceful dip, passing directly over the *Maryland* at an elevation of about 400 feet, then circling and continuing its descent passed over the bows of the *West Virginia* at an elevation of about 100 feet, and completing the turn at about 500 yards on our starboard quarter headed directly for the ship. When about 75 yards astern it straightened up and came on board at a speed of about 40 miles an hour, landing plumb on the center line, missing the first 11 lines attached to the sand bags—but catching the next 11, and stopping within 30 feet with 50 feet to spare, nothing damaged in the least, not a bolt or brace started, and Ely the coolest man on board. Hardly two minutes had elapsed from the time the aeroplane was first sighted, and no one had imagined he would make the landing on the first turn. The sand bags worked perfectly, stopping the machine, weighing, with the aviator, about 1000 pounds, with a speed of 40 miles an hour, within 30 feet, and, as Ely stated, with no perceptible jar. Six pairs of bags did the work, being hauled in over the guide rails close to the machine, the other five pairs being only slightly disturbed. The bags were caught, four on the first set of hooks, three on the second, and four on the third set. As the aeroplane came on board, the upward draft from the wind striking the starboard quarter of the ship lifted it bodily and gave it a slight list to port. This is plainly shown in the accompanying photographs. When the size and weight of the machine, its speed of approach, the elevation from which it descended, and the effect of the wind are considered, the mar-

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] wind, at any desi[illegible] speed, from 10 to 20 knots, under which circumstances the grad[illegible] approach of the aeroplane would have rendered the landing difficult. But the test was arranged, as above described, by officers of the Pacific Fleet to whom the details were entrusted [illegible] co-operation with the Aviation Committee and in accordance w[illegible] the wishes of the aviator.

The following instructive remarks are taken from Ely's acco[illegible] of the flight:

There was never a doubt in my mind that I would effect a succe[illegible] landing on the deck of the *Pennsylvania*. I know what a Curtiss bi[illegible] would do, and I felt certain that if the weather conditions were [illegible] there would be no slip.

velous skill, accuracy of judgment and quickness of brain of the aviator may be imagined. The slightest error of judgment meant serious, if not fatal, injury to both the aviator and his machine. Three feet more of elevation would have forced him to plunge directly into the canvas screen, and three to ten feet less elevation would have caused him to strike the fantail with consequences which can only be surmised.

The flight from the ship, an hour later, was comparatively tame. The aeroplane took the air easily, dipping to within about 10 feet from the surface of the water and then rising to an elevation of about 2000 feet over the city. Within a very few minutes Ely was back on the aviation field, landing within 10 feet of the starting line.

As a result of this experiment and of my observations on the aviation field, I desire to place myself on record as positively assured of the importance of the aeroplane in future naval warfare, certainly for scouting purposes. For offensive operations, such as bomb throwing, there has as yet, to my knowledge, been no demonstration of value, nor do I think there is likely to be. The extreme accuracy of control, as demonstrated by Ely, while perhaps not always to be expected to the same degree, was certainly not accidental and can be repeated and probably very generally approximated to. There only remains the development of the power and endurance of the machine itself, which, as with all mechanical things, is bound to come. There will be no necessity for a special platform. The flight away may be made either from a monorail or from a stay, and either from forward or aft, but preferably forward, while the return landing may be made on the water alongside, and the aviator and his machine afterwards brought on board. In fact, Curtiss has already demonstrated at San Diego the feasibility of not only landing upon the water, but under certain conditions the practicability of also flying from the surface of the water.

Photographs appended show the various stages of landing and departure and the details of the temporary platform used.

It was not originally contemplated to have this experiment require such a severe test of the aviator's skill. It was anticipated that the ship would steam out to sea, head to wind, at any desired speed, from 10 to 20 knots, under which circumstances the gradual approach of the aeroplane would have rendered the landing less difficult. But the test was arranged, as above described, by the officers of the Pacific Fleet to whom the details were entrusted, in co-operation with the Aviation Committee and in accordance with the wishes of the aviator.

The following instructive remarks are taken from Ely's account of the flight:

There was never a doubt in my mind that I would effect a successful landing on the deck of the *Pennsylvania*. I knew what a Curtiss biplane would do, and I felt certain that if the weather conditions were good there would be no slip.

SHOWING LIFT AND LIST CAUSED BY UPWARD DRAFT OF WIND ON STARBOARD QUARTER.

URB ON THE CENTER LINE. RIGHT WHEEL ELEVATED. HOOKS JUST ENGAGING NO. 11 PAIR OF BAGS AS SEEN BY BLACK BAG TO STARBOARD.

SHOWING ACTION OF SAND BAGS.

SHOWING SPECIAL DEVICES, VIZ. AIR TANKS, SKID WITH HOOKS AND HYDRO-PLANE, JUST ABAFT FRONT WHEEL.

EUGENE ELY LEAVING THE U. S. S. "PENNSYLVANIA" IN FLIGHT.
SIDE VIEW OF PLATFORM.

EUGENE ELY LEAVING THE PLATFORM ON U. S. S. "PENNSYLVANIA."
RETURNING TO SAN FRANCISCO.

The atmospheric conditions at the field appeared to be good, but, as I discovered after I got up in the air a few hundred feet, there was a good stiff breeze blowing.

The quality of the air was good. It was heavy and moist and of even pressure. The temperature was cold enough to make me uncomfortable, but I cannot say that the coldness was severe enough to incapacitate me or to interfere with the free use of all the members of my body.

As I came out over the bay above Hunters Point, I was about 1200 feet up. It was cloudy, smoky and hazy. I could not see the ships at first and did not locate them until I was within about two miles of them.

I was spinning along at about 60 miles an hour with the wind directly behind me, and when I sighted the *Pennsylvania* I saw that the stern was pointed into the wind, and when about a mile away I veered off to pass over what I supposed was the flagship *California*. As I neared her I dropped down from 1000 to about 400 feet in salute to the admiral. This ship, however, proved to be the *Maryland*, as the *California* was not in the bay, and I swung around the *West Virginia*, coming down to about 100 feet above the water, and pointed my machine for the *Pennsylvania*. I then made a sharp turn about 100 yards astern of that ship, gradually dropping down.

But there was an appreciable wind blowing diagonally across the deck of the cruiser, and I had to calculate the force of this wind and the effect it would have on my approach to the landing.

I found that it was not possible to strike squarely toward the center of the landing, so I pointed the aeroplane straight toward the landing, but on a line with the windward side of the ship. I had to take the chance that I had correctly estimated just how many feet the wind would blow me out of my course.

Just as I came over the overhang at the stern, I felt a sudden lift to the machine, as I shut down the motor, caused by the breaking of the wind around the stern. This lift carried me a trifle further than I intended going before coming in actual contact with the platform.

If anything I was brought to a stop a little too short and it probably would have been better to have had a little less weight in the sand bags.

The pneumatic life preserver that I had used during the flight from the *Birmingham* at Hampton Roads had proved cumbersome, interfering with the free use of my arms and legs, so on this occasion, I wore only a bicycle tube and found it was much better, as it did not hamper my movements at all.

AEROPLANES AND AVIATORS.

The following decisive and impartial opinion of Wilbur Wright on three types of aeroplanes and their future possibilities is of interest, in view of his accustomed reticence:

The *monoplane* is the ideal form for the *racing* machine, but the fault with this kind is that they have been built too small. The result is that they are very difficult to guide and that their stability is relative. To diminish the surfaces at the increase of speed results in lessening the

safety of the pilot. The *biplane* is heavier and consequently less rapid. Its construction is more difficult since we must take into consideration conditions which do not exist when there is one carrying surface. But its maneuvering is simpler and its stability greater. The *triplane* is almost an exaggeration. Its success in the future seems to me improbable. The addition of the third plane does not offer advantages for stability which deserve to be taken into consideration alongside of the inconveniences which it presents when we consider its resistance to forward motion."

Among the many useful fragments of advice left to us by the lamented John B. Moisant, is the following:

No man should build an aeroplane and then try to fly it unless he has had experience in the air. If the builder is also the inventor and desires to fly his invention, he should first have an experienced airman try it out for him. In other words, the machine should be tuned up by a capable aviator, for as it has been built, it may not be properly balanced or may have some defects to be found only by practical use of it.

Seamen will appreciate the force of this advice as the sailing of fast boats and yachts requires careful tuning up, by experienced seamen, after they are built and the risks involved in air craft are, of course, greater.

Up to the time of Ralph Johnstone's death, November 17, 1910, 22 aviators had perished during the year, not one of whom was an American. In the last half of the year 1910, out of nine who lost their lives four were Americans and out of 37 fatal accidents in the three years' history of aviation, 32 occurred during 1910.

It is notable, however, that not one death has occurred in the use of a Curtiss type machine. Henry Farman, whose machine is similar to the Curtiss, has never had a bad fall, although he has probably covered as much ground as any aviator now flying and has broken the record for sustained flight by being in the air 8 hours and 23 minutes.

Moisant said to a friend only a few days before his tragic death at New Orleans, December 31, 1910, "Most of the aviators who try for prizes will sooner or later get killed." It is a fact that most of the French aviators who have lost their lives in flying were out for prizes. Latham, who has had several falls caused by his own folly says that "*Imprudence* is the cause of the many deaths." To this I am inclined to add that the few deaths caused by defects in the machines have been due mainly to *carelessness*.

Although no aviator has as yet come to grief in an overtown flight, penalties will in future be inflicted by the Royal Aero Club

of the United Kingdom on all aviators who make unnecessary flights over towns, such flights being regarded as dangerous and useless in furthering the progress of aviation. This is the beginning of a safe and sound policy that it is hoped may be followed in America.

The circumstances attending the deaths of Hoxsey and Moisant have familiarized the public with the fact that all aviators recognize the peril of an atmosphere "full of holes" or a "swiss-cheese" air. Balloonists years ago discovered this phenomenon, especially near the earth's surface. The "holes" are regarded as spots of partial vacuum into which an aeroplane will fall, at times, a hundred feet or more. Of course, the vacuum theory is not strictly correct, but the term "holes" furnishes a convenient expression of an effect. Whatever the cause of the drop, it is apparent that at such times if a machine is not inherently well balanced there is grave danger. I refer to this as a possible explanation of the cause of the fatal accidents to Moisant and Hoxsey, the unknown cause of which has given rise to many theories. The two machines used were a Bleriot monoplane and a late-model Wright biplane. Neither of these machines are operated with a front control elevator and it seems reasonable to suppose that the sudden upward pressure, resulting from such a drop, acting effectively under the rear control elevator of the Wright and the rear control and rear plane of the Bleriot at the end of a long lever, the comparatively light tail, was sufficient, in both cases, to throw the tail up to the danger point, thus causing the machines to revolve suddenly about their centers of mass situated near the front ends.

Neither Curtiss nor Farman have removed their front control elevators and it is hoped that they will not do so until this phase of the balance has been thoroughly investigated.

After the above was written it came to my knowledge that J. A. D. McCurdy, during a recent flight over Havana in a very gusty wind was seen to drop suddenly, near Camp Columbia, about 400 feet. He rode a Curtiss biplane and probably found the front control a saving factor on that occasion.

In the amazing list of flying machines that have successfully flown, it is notable that already certain distinct types have become standard and it is probable that further departures from standard types will be made only in step by step processes and not in wide departures from prevailing theories.

The main object of new designers seems, naturally, to provide as nearly as possible an "automatic stability," or at least to get a machine that can be maintained in balance during flights with the least amount of skill on the part of the the aviator. It is also apparent from a glance at many new designs that a low center of gravity is regarded as a means to this end, but an inspection of the standard types shows a preference by experienced designers for a high center of gravity and a comparison of the performances indicates that those having a high center of gravity are steadier in flight and easier to control.

The reason for this is explained, as follows, by Lieut. P. W. Wilcox, U. S. A. R. in *The Airscout* for January, 1911:

An aeroplane is necessarily a very light structure having large surfaces which are necessary to sustain it in flight. The engine, the gasoline and oil tanks, the radiator and passengers, form the bulk of the weight and in a very concentrated form, so that the center of gravity depends upon the center of mass formed by these heavy weights. The rest of the machine being very light has practically no inertia, so that when the machine in flight meets a disturbance in the air such as a side current, if the surfaces above and below the center of mass are not equal the machine will tend to rotate about this center of mass. If the center of gravity be so placed that it is in the center of the machine the tendency to rotate will be neutralized and the side currents will not appreciably affect the balance of the machine. It has often been said that even if a low center of gravity machine be unbalanced by a side current, it would regain its balance before falling any appreciable distance by the parachute effect of the low center of gravity. However, when a machine starts to fall, it almost invariably falls forward directly down, if the rudders are in the rear, so that the sutaining effect of the planes does not amount to anything.

FOREIGN ACTIVITY.

Nearly all countries on the face of the globe are now showing marked interest in aviation and are endeavoring to keep abreast of the times in its development. The greatest activity, however, continues in France, which country evidently intends to increase her lead in the progress of this new art. The Director of the French Military Aviation Service has recommended that the already numerous number of aerodromes be increased through government grant and the French Senate has formed a special Department of Aviation to act conjointly with well known aviators and aeronauts with the idea of furthering aeronautics generally.

A recent test of the new Maurice Farman biplane at Buc resulted in this type machine being adopted by the French Army. This is

specially interesting in view of the success that has attended the distinctly French types of monoplanes in the various contests during the past year. This Farman biplane exceeded the requirements of the specifications by rising from the ground to a height of 300 meters within six minutes and attaining a speed of more than 80 kilometers per hour.

A recent combined flight of an aerial fleet from Pau to Tarbes and return created a distinct military impression. Five Bleriot monoplanes left the aerodrome at Pau in line formation. Four were military machines driven by three army lieutenants and one navy lieutenant. One was driven by a civilian aviator. The flight to Tarbes was led by the naval officer, but the return flight was led by an army officer and it is reported that they "circled over the crowd maneuvering like a squadron at sea."

Great activity in aviation is also promised in Germany. A number of notable cross-country flights have taken place. Military machines are being tested, military experts are being instructed in aviation and an aviation school at Mulhouse, in Alsace, the home of the Aviatik machine, is making good progress.

The Emperor's brother, Prince Henry, obtained a pilot's license in an Aviatik biplane on November 19, 1910, after having been a student of aeronautics for two years, and it is reported from Berlin that the Emperor contemplates holding a review shortly, of those German officers who have qualified as aviators.

An "aerial torpedo," invented by a Swedish officer, will soon be tested at the Krupp works. It is said to be very light, to have a range of three miles and a velocity of 150 feet per second increasing to 1500 feet per second. It is to be launched by a special apparatus and to carry an explosive charge of two and a half pounds. Presumably it belongs to the rocket type but its use has not been explained as yet.

In England, which has been somewhat backward in its encouragement of aviation, there were 50 licensed aviators on December 31, 1910. An aeronautical reserve such as has been formed in the United States, is being organized under the auspices of the Royal Aero Club of the United Kingdom. This club has placed at the disposal of naval officers two biplanes fitted with Gnôme motors and has deputed a skilled aviator to instruct naval officers in their operation.

It is notable that one of the new Paulhan biplanes has been bought by the British authorities without previous test. Since its purchase, however, some cross-country flights and some altitude and endurance tests have been made with it, including one flight of one and a half hours duration.

The peculiar construction of the Paulhan biplane permits it to be packed in a crate measuring 15′ 6″ x 3′ 3″ x 3′ 3″ notwithstanding the fact that its length is 25′ 6″ and its spread 38′.

The first Japanese to win his pilot license (No. 283), was Takygana Yoshitooki. He used a Farman biplane.

HYDRO-AEROPLANES.

The interesting hydro-aeroplane of M. Henri Fabre, which possesses the salient constructional features of Paulhan's biplane, is the first heavier than air machine that has made successful flights starting from and alighting on the water. Its first series of flights were made on May 17, 1910 and recent tests have demonstrated all that is claimed for it. It is fitted with a 50 h. p. Gnôme motor and a two bladed Chauviere propeller.

Mr. Glenn Curtiss was probably the first to experiment with hydroplanes attached to an aeroplane. His experiments, commenced on Lake Keuka at Hammondsport more than a year ago, have recently culminated in successful flights from the water and in alighting on the water at San Diego, Cal. In the preparation for these flights he has simply applied to one of his old standard machines the requisited floating power, by attaching extemporized hydroplanes, with a view to studying the attachments necessary to convert his machine into an effective hydro-aeroplane capable of alighting on and starting from either land or water.

The advantages of this to the navy are apparent when it is considered that successful practice and instruction in aviation requires a suitable aerodrome and that any ship equipped with aeroplanes may now utilize the smooth waters of any harbor for such purposes.

On February 17, 1911, the U. S. S. *Pennsylvania* being in the vicinity of San Diego, Cal., Mr. Glenn Curtiss flew from North Island to that ship and landed on the water alongside. His aeroplane was hoisted on board and later was hoisted out when he quickly arose from the water and flew back to North Island.

Mr. Curtiss has kindly offered to instruct officers in the use of

N H. CURTISS ALONGSIDE U. S. S. "PENNSYLVANIA," SAN DIEGO, CAL. HOOKING ON NO. 2 HYDRO-AEROPLANE, PREPARATORY TO BEING HOISTED ON BOARD.

NN H. CURTISS BEING HOISTED, WITH HIS HYDRO-AEROPLANE NO. 2, ON BOARD U. S. S. "PENNSYLVANIA."

MR. GLENN H. CURTISS IN HIS FIRST HYDRO-AEROPLANE AT SAN DIEGO, CAL.

MR. GLENN H. CURTISS IN HIS SECOND HYDRO-AEROPLANE AT SAN DIEGO, CAL
IN FLIGHT TO U. S. S. "PENNSYLVANIA."

his machines and Lieut. Ellyson, U. S. N., now under instruction, has already made successful flights. Ensign Charles F. Pousland, U. S. N., will also be ordered to this duty.

The following information is gleaned from a report of Mr. Curtiss' aeroplane visit to the *Pennsylvania*, by Lieut. Ellyson:

The water was smooth with light northwest airs, and there was a current running at about 4 knots per hour. No special preparations were made on board the *Pennsylvania*, except to lower one boat, in order that there would be sufficient room to land the machine on the superstructure deck.

The aeroplane used was a standard Curtiss 8-cylinder machine with front control removed and fitted with a pontoon instead of wheels. The engine used was rated at 50 horse-power when making 1200 r. p. m., and was fitted with a traction propeller 7 feet in diameter. The use of a propeller in front, which was experimental, obscured the vision somewhat and rendered the machine less easily controlled. This will not be used in future, as there is no difficulty in performing this same maneuver with the front control in place and the propeller mounted in rear of the planes.

A wherry and a dinghy were used to make fast the steadying lines, and no difficulty whatever was experienced in hoisting the machine both in and out, as will be seen by the photographs appended.

Encouragement is being given to the development of hydro-aeroplanes in Switzerland by the offering of a $2000 prize, the "Eynard prize," for an all-Swiss aeroplane piloted by a Swiss aviator which shall make the best time in a flight from one end of Lake Geneva to the other, alighting on the water three times. Each start from the water must be made within a distance of 1000 meters and none of the stops must be longer than 30 minutes.

This will doubtless provide an additional attraction for tourists and will be a long stride in the direction of aqua-aerial yachting, as the dangers of a fall will be minimized.

I regard the introduction of the hydro-aeroplane as one of the most important steps in the rapid development of aviation that has yet been undertaken.

WHAT HAS BEEN ACCOMPLISHED.

Ely has proved that an aeroplane can leave a ship and return to it, even with crude preparations that may be readily improved upon for practical work. Others have demonstrated that an aeroplane can remain in flight for a long time, from five to eight hours or more. Others have demonstrated that observations can be made from great altitudes, that photographs can be taken, that recon-

noissances can be made, that messages can be sent and received by wireless telegraph, that passengers can be carried, that the aeroplane may be stowed on board in suitably dimensioned crates or boxes and readily assembled for use in less than one hour, and that it is possible to hoist an aeroplane out and in, as you would a ship's boat, to exercise it over smooth water. Mr. Curtiss has also recently demonstrated that it is not necessary for the water to be smooth.

This has all been done within a year and mostly, in a few months, since the date on which the navy first began to take serious notice of the possibilities in aviation. In this short space of time many new ideas for improvement in the aeroplane for naval service and in the accessories necessary for naval use have been brought to the eve of development and there is reason to believe that after a little of our anticipated experience with this auxiliary in the navy, its spheres of usefulness will be generally acknowledged.

Atmospheric conditions still govern these performances to a great extent, but the perfect calm that was necessary a few years ago is no longer required and fresh breezes do not now deter even the most prudent of aviators.

The aeronautical exhibition held at Boston February 20-25, 1911, although less extensive than that held at Paris in October, 1910, clearly showed that great improvement in the character of aeroplane craftsmanship has been made, in this country, within the last six months. The workmanship on the new machines compares favorably with that of the best French machines exhibited during the meet at Belmont Park.

The manufacture of aeronautical accessories has become an established industry in the United States and it is now possible for anyone desiring to construct an aeroplane to buy from many firm nearly all the parts of successful machines, ready prepared in accordance with proved standards. This standardization makes for safety in the use of such parts as spars, struts, ribs, surfaces, braces, wires, turn-buckles, bolts and joints.

There has been notable progress also in the manufacture of aeroplane motors and their accessories, especially in those of the revolving type. Although some have not been thoroughly tested in flight, several appear to embody distinct improvements over the celebrated " Gnômes." The improvement of the two-cycle engine was also a notable feature at the Boston show, and it would seem

that a reasonable certainty of action, or reliability sufficient for aerial navigation, is now practically assured.

For the information of officers interested in becoming proficient in aviation the following requirements are noted:

RULES AND REGULATIONS FOR THE ISSUE OF PILOTS' LICENSES.

Applicants must pass the three following tests:

(A) Two distance tests, each consisting in covering, without touching the ground, a closed circuit of not less than five kilometers in length.

(B) An altitude test consisting in rising to a minimum height of 50 meters above the starting point.

(C) The (B) test may be made at the same time as one of the (A) tests.

The course over which the aviator shall accomplish the aforesaid circuits must be indicated by two posts situated not more than 500 meters from each other.

After each turn made around a post the aviator will change his direction so as to leave the other post on his other side. The circuit will thus consist of an uninterrupted series of figure eights, each circle of the figures alternately encircling one of the posts. The distance credited over the course covered between the two turns shall be the distance separating the two posts.

For each of the three tests the landing shall be made:

(1) By stopping the motor not later than the time when the machine touches the ground.

(2) At a distance of less than 50 meters from a point designated by the applicant before the test.

GENERAL DETAILS

Nation.	Pilot and Make of Flyer.	Length over all.	Breadth over all.	Supporting Surface (sq. ft.)	Wings.		Rudders.	
					Spread.	Chord.	Vertical.	Horizontal.
France	Alfred le Blanc, Bleriot (100 Gnôme).	23′	26′	150 (ap.)	12′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
France U. S.	Alfred le Blanc, Bleriot (XI Bis.) (sold to Moisant).	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
U. S.	J. B. Moisant, Bleriot (2 seat).	22′	32′	210 (ap.)	15′ (each)	7′	Oval shape	2 semi-circular flaps
U. S.	J. B. Moisant, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
U. S.	J. A. Drexel, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
Eng.	Jas. Radley, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
Eng.	C. Grahame-White, Bleriot (100 Gnôme).	23′	26′	150 (ap.)	12′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
Eng.	C. Grahame-White, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
Eng.	W. E. McArdle, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
France	René Barrier, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
France	René Simon, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
France	Emile Aubrun, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
France	Roland Garros, Santos-Dumont, "Demoiselle."	20′	18′	100 (ap.)	18′	6′ 6″	Combination vert. and hor. rudder.	
Switz.	E. Audemars, Clement Bayard, Demoiselle."	20′	18′	100 (ap.)	18′	6′ 6″	Combination vert. and hor. rudder.	
France	Count J. de Lesseps, Bleriot (2 seat).	22′	32′	210 (ap.)	15′ (each)	7′	Oval shape	2 semi-circular flaps.
France	Count J. de Lesseps, Bleriot (XI Bis.)	23′	28′	160 (ap.)	13′ 6″ (each)	6′ 6″	2′ 11″ x 3′	38″ x 35″
France	Hubert Latham, Antoinette Racer.	42′	40′	...	19′ (each)	8′ 6″ to 7′	2 triangular	1 triangular rudder
France	Hubert Latham, Antoinette (50 H. P.)	42′	46′	377	22′ (each)	8′ 6″ to 6′ 6″	2 triangular	1 triangular rudder

MONOPLANES.

Tail.	Lateral Stability.	Landing Chassis.	Motor.				Propeller.			
Fixed Hori-zontal Surface.			Make.	H. P.	Cooling.	Igniting	Make.	Blades.	Diam-eter.	R. P. M.
'x [illegible]'	Warping	2 castor wheels & skid	Gnôme, 14 cyl.	100	Air	Bosch	Régy Frères	2	7'11"	1800
x [illegible]"	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
at tri-angular	Warping	3 castor wheels	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x 35"	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x [illegible]'	Warping	3 castor wheels	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x [illegible]"	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x [illegible]'	Warping	2 castor wheels & skid	Gnôme, 14 cyl.	100	Air	Bosch	Chauvière	2	7'11"	1800
'x [illegible]"	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7'11"	1200
'x [illegible]"	Warping	3 castor wheels	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x [illegible]"	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x [illegible]"	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
'x 25'	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
None	Warping	2 wheels & skid	Clement Bayard, 2 cyl.	30	Water	Bosch	Chauvière	2	6' 6"	1100
None	Warping	3 wheels	Clement Bayard, 2 cyl.	30	Water	Bosch	Chauvière	2	6' 6"	1100
at tri-angular	Warping	3 castor wheels	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
x 25'	Warping	2 castor wheels & skid	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	7' 6"	1200
ge tri-gular	Warping	2 wheels & skid	Antoi-nette, 16 cyl.	100	Water	Bosch	Normale	2	7'11"	1200
ge tri-gular	Warping	2 wheels & skid	Antoi-nette, 8 cyl.	50	Water	Bosch	Normale	2	7'11"	1200

GENERAL DETAILS

Nation.	Pilot and Make of Flyer.	Length over all.	Breadth over all.	Supporting Surface (sq. ft.)	Wings.		Rudders.	
					Spread.	Chord.	Vertical.	Horizontal.
U. S.	H. S. Harkness, Antoinette (2 seat).	42'	46'	377	23' (each)	3' 6" to 6' 6"	2 triangular	1 triangular rudder
U. S.	H. S. Harkness, Antoinette (1 seat).	42'	46'	377	23' (each)	3' 6" to 6' 6"	2 triangular	1 triangular rudder
U. S.	Glenn H. Curtiss (single surface).	25'	26'	130	26'	5'	4' x 3'	3' x 1' (flap)

DETAILS OF

U. S.	C. F. Willard Curtiss (special).	34'	32'	300	32'	5'	3'4" x 2' 8"	7' x 30" (Biplane)
U. S.	Eugene Ely, Curtiss.	28'	26'	263	26'	4' 6"	3' x 2' 4"	6' x 2' (Biplane)
U. S.	J. C. Mars, Curtiss.	28'	26'	263	26'	4' 6"	3' x 2' 4"	6' x 2' (Biplane)
U. S.	J. A. D. McCurdy, Curtiss.	28'	26'	263	26'	4' 6"	3' x 2' 4"	6' x 2' (Biplane)
U. S.	J. F. Frisbie, Curtiss type.	28'	26'	263	26'	4' 6"	3' x 2' 4"	6' x 2' (Biplane)
U. S.	C. H. Hamilton, Hamiltonian.	30'	31'	310	31'	5'	4' x 3'	7' x 25" (Biplane)
U. S.	C. K. Hamilton, Hamiltonian.	28'	26'	263	26'	4' 6"	3' x 2' 4"	6' x 2' (Biplane)
Eng.	C. Grahame-White, Farman.	38'	33'	429	33'	6' 6"	Two	6' x 2' 6" and flap
U. S.	C. B. Harmon, Farman (modified).	33'	33'	429	33'	6' 6"	Two	6' x 2' 6" and flap
U. S.	Walter Brookins, Wright racer.	19'6"	21'6"	146	21' 6"	3' 6"	Twin vertical rudder	3' x 2'
U. S.	Ralph Johnstone, Wright.	....	39'	485	39'	6' 2"	Twin vertical rudder	12' x 30"
U. S.	Arch. Hoxsey, Wright	...	39'	485	39'	6' 6"	Twin vertical rudder	12' x 30"
U. S.	R. Johnstone, Wright high flyer.	19'6"	26'	180	26'	3' 6"	Twin vertical rudder	3' x 2'
Eng.	Alec. Ogilvie, Wright roadster.	19'6"	22'	160	22'	3' 6"	Twin vertical rudder	3' x 2'
U. S.	P. O. Parmelee, Wright.	....	39'	485	39'	6' 6"	Twin vertical rudder	12' x 30"
U. S.	Tod. Schriver, Curtiss type.	30'	31'	310	31'	5'	4' x 3' (approx.)	7' x 3' (single)

MONOPLANES.—*Continued.*

Tail.	Lateral Stability.	Landing Chassis.	Motor.				Propeller.			
Fixed Horizontal Surface.			Make.	H. P.	Cooling.	Igniting	Make.	Blades.	Diameter.	R. P. M.
Large triangular	Warping	2 wheels & skid	Emerson, 6 cyl.	50	Water	Bosch	Antoinette (metal)	2	7' 6"	1200
Large triangular	Warping	2 wheels & skid	Antoinette, 8 cyl.	50	Water	Bosch	Antoinette (metal)	2	7' 6"	1200
7' x 1' 6" (fixed)	Ailerons	3 wheels	Curtiss, 8 cyl.	60	Water	Bosch	Paragon	2	7'	1200

BIPLANES.

Tail.	Lateral Stability.	Landing Chassis.	Make.	H. P.	Cooling.	Igniting	Make.	Blades.	Diameter.	R. P. M.
7' x 27"	Ailerons	3 wheels	Curtiss, 8 cyl.	60	Water	Bosch	Curtiss	2	7'	1200
6' x 25"	Ailerons	3 wheels	Curtiss, 8 cyl.	60	Water	Bosch	Curtiss	2	7' 6"	1250
6' x 25"	Ailerons	3 wheels	Curtiss, 8 cyl.	60	Water	Bosch	Curtiss	2	7' 6"	1250
6' x 25"	Ailerons	3 wheels	Curtiss, 8 cyl.	60	Water	Bosch	Curtiss	2	7' 6"	1250
6' x 25"	Ailerons	3 wheels	Hall-Scott, 8 cyl.	60	Water	Bosch	Hall	2	8'	1100
7' x 30"	Ailerons	3 wheels	Hamiltonian, 8 cyl.	110	Water	Bosch	Charavay	2	7' 11"	1100
6' x 25"	Ailerons	3 wheels	Hamiltonian, 8 cyl.	60	Water	Bosch	Charavay	2	8'	1100
Biplane	Ailerons	4 wheels & skids	Gnôme, 7 cyl.	50	Air	Bosch	Chauvière	2	8'	1200
Biplane	Ailerons	4 wheels & skids	Gnôme, 7 cyl.	50	Air	Bosch	Regua-Gibson	2	8'	1200
None	Warping	4 wheels & skids	Wright, 8 cyl.	60	Water	Mea	Wright (two)	2	8' 6"	500
None	Warping	4 wheels & skids	Wright, 4 cyl.	30	Water	Mea	Wright (two)	2	8' 6"	450
None	Warping	4 wheels & skids	Wright, 4 cyl.	30	Water	Mea	Wright (two)	2	8' 6"	450
None	Warping	4 wheels & skids	Wright, 4 cyl.	30	Water	Mea	Wright (two)	2	8' 6"	450
None	Warping	4 wheels & skids	Wright, 4 cyl.	30	Water	Mea	Wright (two)	2	8' 6"	450
None	Warping	4 wheels & skids	Wright, 4 cyl.	30	Water	Mea	Wright (two)	2	8' 6"	450
7' x 30"	Ailerons	3 wheels & skid	Kirkham, 6 cyl.	40	Water	Bosch	Charavay	2	7'	1200

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TRAINING OF THE PERSONNEL OF THE FLEET FOR BATTLE.

By Rear-Admiral A. C. Dillingham, U. S. Navy.

Success in battle is the ultimate object of our training, so that a progressive system is necessary, culminating in the greatest efficiency when engaged in battle. Our fleet *is* progressing, it is assuming more and more a military character with the fleet policy of to-day, when it seems possible to keep the fleet assembled for training, avoiding the demoralizing effects of long and unnecessary delays at navy yards, and frequent interruptions in using the fleet for other than military purposes. It is acknowledged that our present system of training recruits at training stations is giving good results, while the commander-in-chief of the battle fleet has instituted progressive training for the enlisted personnel in fleet, which is far in advance of anything ever undertaken before, and sure to give good results; the time spent at Guantanamo by the fleet, with the admirable routine for training, should advance the enlisted personnel in a general knowledge of its business. We must not forget that with 76 per cent of our men on their first enlistment, much more time must be occupied with training than would be the case if we had a larger continuous service force. Were 76 per cent of our men continuous service men the question of their training would be greatly simplified, for continuous service men should mean trained men. It would seem that we are doing the best possible for the enlisted personnel. Let us now consider the commissioned personnel.

With the routine for drills, etc., aboard ship the junior officers, having professional zeal, must progress. The battleship, scouts, destroyers, tropedo-boats, submarines and aeroplane, give to these officers the very best of training. The captains when in fleet are studying the tactical value of their ships, and with the experience

of frequently getting under way, coming to anchor, at target practice and in cruising in formation or separately, with frequent opportunities for handling their ships separately, they should be au fait in the school of the ship, while battle drills are preparing them for junior flag rank. All officers of command rank should have a course at the war college, and this, if possible, before taking a command afloat, and the captain who is eligible to flag rank in fleet should not have shore duty other than at the war college. With our present system of promotion there are many captains who have no possibilty of being in fleet with flag rank. It is from such captains that details for navy yards and other shore duty should be made. It would seem that there is every reason to expect efficiency from our officers up to flag rank, but there does not seem to have been made any effort to develop the efficient flag officer who should be the head, the brains to lead our fleet to battle. There must be a school in fleet for flag officers; they must have more training, must be given the opportunity, under as nearly as possible battle conditions, to get the necessary experience, and to develop whether or not they are actually capable of performing the service that may be required of them.

In our service, if one's health and morals are good, it is not difficult to reach flag rank, but have all who reach this position the natural capacity for the duty required? We must have the best, and this can only be assured by giving to flag officers the opportunity to develop what may or may not be in them. At present flag duty in fleet seems to be due to accident of birth, rather than tried efficiency. It is found at the war college that certain officers develop a keen faculty as tacticians, others have aptitude for strategetic work. Some officers in obtaining initial positions, for instance, can at once set the course and formation, while others are undecided, and fail to grasp the situation. The former will gain the advantage, while the latter may lose the opportunity for success. Some officers upon being given a problem, with the chart before them, can at once locate the position of strategic advantage, while others less keen find great difficulty in making a decision. The school for flag officers should develop the best, which are the ones we must have. So far the commander-in-chief has assumed a position which not only prevents him from having the experience which he should have in order to properly conduct the fleet in battle, but which deprives the junior flag officers of the training which they must have in order to become efficient. In

foreign services the greatest importance is attached to the training of flag officers; they are sent afloat for a year's training and relieved by others, so that the government, in time of peace, may be able to select the most efficient for the purposes of war.

Our division commanders have complained that they did practically nothing in fleet; that they were without responsibility or opportunity for practice; that they were learning nothing comparatively. This condition arises in a great measure from having the commander-in-chief in formation, in command of a division. There is no tactical reason why a commander-in-chief should be in formation. In time of peace there is every reason why he should not be in formation. It is understood that the Department contemplates placing a division commander for each division, with the commander-in-chief out of formation. This, with a proper system of training for flag officers in battle work, will supply a want that has been sadly needed in fleet, and should develop flag officers fit for service in time of war. In the school for flag officers the methods should pertain only to the actual conditions of battle. A flag officer should have the experience in the practical handling of his force under battle conditions, as for instance, with his force organized as for war and operating against another force, he should seek advantage in initial position, and so conduct his force that he shall maintain the advantage with the least possible change in the rate of change of range. How easy it is to write such a phrase, "Seek initial position and so conduct his force that he shall maintain the advantage with the least possible change in the rate of change of range."

This is battle tactics. This is the practical business of the flag officer. What a tremendous responsibility he has. Consider the approach of two modern fleets and try to realize the responsibility resting upon the commander-in-chief and the junior flag officers. Should an officer be allowed to accept such responsibility without having had the proper training? And when we consider that efficiency or inefficiency may mean success or defeat of our fleet, is it a wonder that our flag officers demand that they be given the opportunity for practical experience, that they may be able to make good when called upon. If we are to maintain a fleet upon the supposition that war may come at any moment, are we not bound to develop at once the efficient flag officer to conduct the fleet in battle? Let us suppose war within three or six months, we can depend upon our enlisted personnel, but where are the flag officers

who have had the training necessary to conduct our forces? We shall have to compete with flag officers who have had training as such. It would seem to be a serious and alarming condition, demanding immediate steps to be taken to secure proper battle training for our flag officers. Look over the list of flag officers available for war purposes, can we find one who has had training, one who has had the experience in battle work so absolutely necessary? The present commander-in-chief will soon reach the age limit, is it not a matter of regret that the exigencies of the service required his prospective successor to leave the fleet for shore duty, causing him to lose the practical training preparatory to assuming such responsibility.

This new commander-in-chief must now rid his mind as soon as possible of all thought of navy yard administration and assume the serious responsibilities of commander-in-chief without any preliminary battle training. In time of peace his is a difficult position. Can we imagine a more difficult position or a more serious one in the event of an early war, or one which might give the country greater anxiety? It would seem far better from a practical view point to continue the present commander-in-chief with his experience, regardless of his retirement, if he is taken out of formation, and the junior flag officers given the training in battle tactics, preparatory to a selection for commander-in-chief. Till lately, we have never been able to get beyond a preliminary stage in battle tactics. This has been due in the past to the frequent changes of commanders-in-chief, and the lack of any progressive system for training flag officers; and recently to the fact that the commander-in-chief has apparently assumed the duties of commander-in-chief, squadron and division commander. There has never been systematic training of junior flag officers, our squadrons have never been sufficiently exercised in actual battle practice. I do not criticize the commander-in-chief. No doubt conditions existed which prompted a different course. The fact that our division commanders have lately been pitted against each other shows his appreciation of the necessity for such training.

As the school for flag officers should be put in operation it is well to consider how best to conduct the school. Let the problem for the school for our flag officers be, *war with the most probable enemy of to-day*, and for the purpose of training our flag officers, instead of operating our squadrons or divisions against each other, let us make the other as nearly as is possible tactically equal to a

similar force of the most probable enemy of to-day. Bring to the fleet all the offensive auxiliaries, such as scouts, destroyers, torpedo-boats, submarines and aeroplanes. Put these forces out of touch, under the command alternately of the junior flag officers. Declare then a state of war, and require the junior flag officers to conduct their forces. We shall then have information, the approach, in touch and to battle. In getting probable results we could use the scores made by our own ships at their last battle practice, and for the most probable enemy's ships the information, positive or assumed, upon the subject. These exercises should be had as frequently as is possible and under all possible conditions of sea room and weather. The commander-in-chief should prescribe the conditions, and a report in detail of every movement and incident, from the declaration of war to the end of the exercises, should be submitted as a test of the capacity and efficiency of the flag officers engaged. With the administration of the units of the fleet, it would seem that the commander-in-chief need not be concerned further than to know when any unit of his fleet is not able to obey at once any signal he may make.

Let the responsibility for preparedness and efficiency be with the division commander, to the squadron commander and from the squadron commander to the commander-in-chief. Develop as soon as possible the individuality of the flag officer, his capacity and his talents, his general worth for assuming the great responsibility which must devolve upon him as commander-in-chief.

The practical business of the fleet is to capture or destroy the vessels of any enemy which it is its duty to encounter. Ideal conditions would exist, if the fleet were of such a composition, and in such a state of efficiency, as to meet the demands of any national policy, and able to compete, successfully, in battle, with all comers; but no such conditions exist, and to-day, during this era, the practical question is, how to use the force that is actually at our disposal, so as to be able to successfully compete with the force of the most probable enemy of to-day. We know exactly what force we have available, and what additions to this force are actually in sight and available for the immediate future, and, considering the political aspect of the world, we may decide which nation is the most probable enemy. Our whole business is to follow such a fleet policy as will prepare this force actually existing, to capture or destroy the vessels of this most probable enemy, and a consideration of any policy, exercise, drill or maneuver that has

not to do directly with these conditions is a waste of time. In handling this force the only axioms and theories of naval tactics that are of any use for our purpose, are those that will apply to our present conditions of having a definite force to deal with a definite enemy; all other considerations are foreign to the practical business of the fleet and until our forces are, in all respects, ready to fight this most probable enemy, we are deficient. The general study, by officers of the service, of naval policy, strategy, and tactics, is the natural consequence of an increase of material. With the organization of our force, officers are led to consider the best methods of handling this force, and the result has been numerous articles bearing upon this most important subject of naval tactics, all of which shows a proper trend of thought in professional channels. The broad study of naval tactics is essential to the making of a capable commander. He should study the theories, and consider the axioms in naval tactics, with a view to applying them when required to do so, but for the practical purposes of the fleet to-day only such theories and axioms as apply to our present conditions, where we are considering the handling of a specific force, against this specific force of our most probable enemy, are of any practical use. The methods to be employed, the tactics to be used in battle, will depend upon the character of our enemy, and for practical training it is of the greatest use to assume an enemy which, considering the political aspect of the world, would seem to be the most probable. In fact the political aspect of the world is the guide for the commander-in-chief. Battle tactics cannot be written, they must be practiced under battle conditions.

Such tactics will ever change with the change of conditions. To-day a particular nation may seem our most probable enemy; complications may arise that will change the political aspect and some other nation will loom up as our most probable enemy. But the objective of our battle training should never change. It should always be the most probable enemy of to-day. We have developed certain axioms from the game board, and battle tactics is the application of these axioms to the conditions under which the battle is to be fought. We can create or imagine innumerable conditions, and can present no end of problems, but the problem that concerns us first and most, is war with our most probable enemy. There is no creation, nor imagination, in this, it is a plain, practical, probable fact, and I believe the solution of this

problem can best be made by causing in all cases where our forces are maneuvering against each other, that one force represent, as nearly as possible, the tactical conditions of our most probable enemy. Our ships are not built to fight each other, nor are squadrons organized to operate against each other; and I make this point, that in handling one of our squadrons against another of our squadrons for battle drill purposes that it is altogether best to use tactical conditions that it is most probable we shall have to contend with in war. The tendency of some officers who have written upon naval tactics seems to be to lose sight of the absolute necessity for the simplest formations, with the fewest possible changes of formation; there seems to be a tendency to search for some mysterious method that will settle the entire question of tactics. This, I think, comes from a lack of practical experience at the game board, and in fleet, and the failure to appreciate the actual conditions of battle, and the requirements of the practice of modern gunnery. Battle tactics may be defined as taking that position where our shooting will be better than that of the enemy and maintaining that position with the least possible change of the rate of change of range. Every officer, I am sure, will agree that we must have the greatest volume of fire possible with the least possible change in the rate of change of range. These conditions *demand* the simplest possible formations with the fewest possible changes of formation, and the successful tactician is the one who can maintain such a position, and require the enemy to make the change of course, or formation. Furthermore, it must be acknowledged that we cannot get results from paper work; that we *must* have practice afloat, and that to have battle practice, we must have conditions as nearly as possible approaching those of battle. Why is it not practical and best to use those conditions which it is most probable we shall have—conditions of war with our most probable enemy. If we select a specific force, such as that of our most probable enemy, we create an objective for our battle practice, and eliminate generalities by confining our methods to this specific force. From a general consideration of the training of our personnel, it appears that our system up to flag rank is good and should give good results, but that we are greatly in need of a system of training our flag officers.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SKELETON, OR PLOTTING, CHARTS.

A SUGGESTION RECENTLY LAID BEFORE THE HYDROGRAPHIC OFFICE.

By LIEUT.-COMMANDER RAYMOND STONE, U. S. Navy.

Graphical solutions of the problem of finding a ship's position at sea, by plotting and intersecting Sumner lines, lines of bearing, etc., being nowadays so general in our service, especially since the almost universal adoption of the Marcq St. Hilaire method, I am submitting a suggestion concerning what may be termed skeleton, or plotting, charts, which will, I believe, prove of great value and convenience to navigators, and of no great expense or trouble to the hydrographic office. For a plotting chart such as I have in mind there are three requisites:—

(a) It should be of sufficiently large scale to permit of accurate plotting and picking off.

(b) It should be sufficiently small in physical dimensions to permit of handy use on the restricted chart desks and in cramped chart rooms of modern fighting ships.

(c) It should be on paper sufficiently tough and durable to stand numerous erasures.

The following features are suggested, viz.:—

Projection.—Mercator.

Scale.—One inch equals 10′ of arc in longitude.

Dimensions.—Between inner neat lines, 30 inches in width (5° of longitude) and a sufficient height to contain 5° of latitude stretched in conformity with the Mercator projection. Even 3° of longitude, 18 inches width, will suffice.

Delineation, Hydrography and Topography.—None needed.

Measuring Scale.—One of the interior meridians and one of the interior parallels to be subdivided into minutes of arc. For con-

venience the marginal lines might also be subdivided, but this is not strictly necessary; though the inner scales might become obliterated by frequent erasure.

Range of Chart.—From 0° to 60° in latitude, a set of 12 charts in all. Our ships rarely get in higher latitude than 60.° The charts are good in either north or south latitude.

I do not claim exclusive originality in this suggestion; and I am aware that it may be said of such suggestion that on any ship of size the navigator or his midshipman assistant could easily construct such a chart in an hour or two, as needed; in fact I know that this has been done on occasion. But in these modern days of multiple and multifarious duties the navigator has little time except for sights and solutions, and his assistant is frequently so in name only, being primarily occupied with matters of gunnery training, fire-control, etc. And further, the accuracy of such improvised charts is open to question.

The general usefulness of such a plotting chart seems obvious; and its specific and particular handiness to the navigator who (at least in some of our ships) must, by rules of organization, spend a considerable portion of the precious forenoon in charge of the bridge, as the relief of the regular watch officer while he is away at drills and divisional duties, seems even more than obvious.

LATER.—Acting on this suggestion the Hydrographic Office has prepared and is furnishing to ships a fine set of charts called "Position Plotting Sheet." Since writing the foregoing article I am informed by the editor that charts of this sort are used in the British service and have long been on sale in Great Britain and her colonies.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A SEA VIEW OF OUR REVOLUTION.

By Edgar S. Maclay, A. M.

I. Importance of Our Sea Operations.

When we remember that all the general histories of the United States, recognized as standard, have been written by landmen, we can understand how military operations ashore during our Revolution have received their full measure of notice and how equally important occurrences afloat have been almost ignored. It may safely be declared that the cornerstone of American history is Bancroft's monumental work, with that of Hildreth supplementing it—the first favoring one great political party and the second the "opposition," but each giving scant attention to the important part our maritime forces played in securing the independence of the United States.

It seems to be on this foundation, so firmly laid by Bancroft and Hildreth, that succeeding American historians have builded and enlarged their superstructure; all giving full justice to operations on land and all failing, proportionately, to give due prominence to important occurrences at sea—as shown in the great works of John Bach McMaster and Woodrow Wilson. And even in that latest and greatest general history of the United States (by Elroy McKendree Avery in 16 royal octavo volumes, now in course of publication), where evident effort has been made to restore historical land and sea equilibrium, the balance is still far from normal.

It is well within the fact to state that all of our general histories of this country give at least ten times more space to military operations on land than to sea occurrences—from which the reader naturally would suppose that the former were ten times more extensive or important than the latter—and that, unquestionably, is the impression that has dominated the American public for more than a century and a quarter.

A careful summary of the *bona fide* battles (not mere skirmishes but actions in which men were killed or wounded) in our Revolution will show that 57 were fought on water as opposed to 48 on land; that in the 57 on water the Americans won 41, lost eight and had eight indecisive; while in the 48 battles on land we had 19 victories, 26 defeats and three indecisive. In this summary, as in all other compilations in this article, State cruisers and privateers are included in our sea forces. This is no more than just. These private-armed vessels were authorized by Continental Congress and commissioned by the States (colonies) from which they sailed. Many of them were commanded by officers in the navy or by men who afterward entered the regular service. They formed the "militia of the sea" and were quite as much entitled to official recognition as the many bands of riflemen, companies and even regiments that were enlisted under private auspices during the Revolution and who, at first, formed the bulk of our armies.

Probably it never will be known how many men served in our land forces during the Revolution. They were coming and going most of the time so that it is impossible to determine their exact number, but it is doubtful if Washington ever had under his command, at one time, more than 15,000 disciplined and well-equipped Americans. According to Bancroft * (Vol. V, p. 17): "Washington never had [before Boston] more than 14,500 men fit for duty." For the same reason it is impossible to arrive at the exact number of seamen who manned our militant craft in the struggle for independence, but we do know that from 1775 to 1782 we commissioned 856 Continental and private-armed vessels and, allowing the very moderate average of 50 men to each, we have a total of 42,800.

Of course, many of these men enlisted several times so that 42,800 by no means represents the force actually in service at one time, but, by taking a single year, we can gain a fairly accurate estimate of the number of our sea fighters. For instance, in 1776 we had 167 war craft (mounting 1946 cannon and swivels) in commission. Allowing 50 men to each, we have a formidable army of 8350 men handling nearly 2000 cannon and swivels—a park of artillery field-marshals in those days scarce dreamed of.

* All quotations from Bancroft in this article are from the centenary edition.

In 1777, when our sea forces were at their lowest ebb, we commissioned 107 war craft, mounting 1142 cannon and swivels and manned by no fewer than 5350 men. In 1780 we had in commission 241 war ships, mounting 3686 cannon and swivels and manned by no fewer than 12,000 splendidly drilled mariners, while in 1781 we commissioned 458 fighting craft, mounting 6899 guns and manned by more than 22,000 of the best sea warriors the world had then seen.

Striking an average from each of the seven years of this war, we find that we had in commission during that period, 232 war craft, mounting 3359 cannon and swivels and manned by 11,600 well-equipped, perfectly disciplined and thoroughly seasoned mariners. This was the magnificent body of men who formed the vanguard of American independence. It was through this cordon of veterans of the sea that the invading armies had to pass before setting foot on the shores where our forefathers were fighting for their liberty.

It is far from the writer's purpose to, in any degree, disparage or belittle the noble part played by our land forces in the Revolution—the only object here being to give proportionate credit to our sea fighters of the same period and the following comparisons should be regarded in that light.

Because of that daring and laudable exploit which resulted in the capture of Ticonderoga, with its garrison of fifty men, many American geographical points have been named in its honor. It is but natural to ask: how many similar geographical points have been named in honor of the Yankee privateer *Tyrannicide* which captured a British transport having on board 63 Hessian chasseurs or of the Continental cruiser *Alfred* which captured a transport with more than 100 troops aboard?—both equally daring and laudable exploits. Every American school boy has read of the capture of Stony Point with its garrison of 543 men, but how many know of the capture of 300 British soldiers with their colonel in two transports, after a severe engagement, by the little cruiser *Lee;* or of 200 Highlanders and 20 army officers of the 71st Regiment by our *Andrea Doria?*

We have all read of the bold seizure of Major Prescott by the patriots, but how many of us know of the capture of a colonel, four lieutenant-colonels and three majors of the English Army by the 18-gun privateer *Vengeance?* Major Prescott was cap-

tured by the American land forces, but one officer in the British service at that time had the distinction of being captured three times by our sea forces. He was Lieutenant Campbell, taken just off Boston when endeavoring to land. A few years later, when a major and on his way from New York to Savannah, he was again captured. Again being exchanged he was captured for the third time (then having the rank of lieutenant-colonel) by one of our war ships while on his way across the Atlantic to England.

Altogether, more than 1000 soldiers of armies England sent across the Atlantic to fight against our patriotic forefathers, were captured at sea by our seamen. In the 57 battles in which our sailors of the Revolution engaged, a total of 1010 Americans fell, killed or wounded; while they inflicted a loss of 1507 on the enemy. A magnificent monument and an even more magnificent oration perpetuates the fame of the 449 Americans who were killed or wounded at the Battle of Bunker Hill and who inflicted a loss of 1054 on the enemy. Where is the monument or oration that distinctively perpetuates the memory of those sea fighters who suffered far greater losses and inflicted far greater injury on the enemy than did the heroes of Bunker Hill?

But it was not the loss of her troops that "cut England to the quick" so much as the loss of her sailors. She could replace her soldiers so long as the stock of mercenaries held out, but she could not replace her sailors; and it was right here that our army of 11,600 sea warriors struck their most effective blows. We all know that nearly 1000 prisoners were taken at Trenton, that Gates made some 8000 prisoners at Saratoga and that the American and French arms secured some 7000 at Yorktown, but how many of us know that *fully 16,000 English sailors were made prisoners on the high seas during the Revolution by American war craft?*

II. AMERICAN PREPAREDNESS AT SEA.

Thus far in this article we have dealt in figures and statements which seamen might aptly term "gross tonnage" or "bulk." We will now investigate the quality of the "cargo" we have been handling. To foil the charge of wilfully antagonizing our land forces we will confine our quotations to the aforesaid histories written so conspicuously in favor of our shore operations by landmen.

That Americans are preeminently a maritime people was shown

in their extraordinary preparedness at sea and capacity for fighting on water—from the beginning to the end of the Revolution—as contrasted to their unpreparedness for active military operations on land. From the day hostilities broke out, our seamen were in complete readiness for battle and began that assault on England's commerce and transport service which so seriously interrupted her plans. Our ships and sailors were ready at the word. There were no months, weeks or even days wasted in "drilling raw recruits," there were no commissary or quartermaster departments to delay provisioning and equipping our armed craft, there were no long complaints from our commanders about the difficulty, ay, impossibility, of securing arms and the munitions of war.

There were a few instances where Yankee craft put to sea short-handed, poorly equipped and insufficiently supplied with provisions, but, by means of seizures on the high seas or by other methods devised by the ingenuity of their commanders, they managed to remedy these failings without appealing to Continental Congress. And it can be truly said that there were no epidemics or contagious diseases breaking out and incapacitating entire ship's companies: and with even greater truth, it may be said that no seasickness, "homesickness" or any other kind of ailment resulted in large detachments of sailors returning to their homes after enlisting.

All these amateurish details had been attended to and mastered by our sea warriors long before the Revolution broke out so that, when the hour came, they set sail in staunch craft, sufficiently well armed, equipped and provisioned to render instant active service in the cause for which they were contending. The officers were experienced and accustomed to their commands; the crews were thoroughly disciplined and eager for the fray.

In striking contrast to our preparedness to fight at sea, we have the unorganized, undisciplined and generally confused condition prevailing among our land forces at the outbreak of the Revolution. Speaking of the army collected before Boston to drive the English out, Bancroft says (Vol. V. p. 154):

> The troops before Boston were a mixture of new recruits and transient militia whose frequent mutation called for constant renewal of elementary instruction. There was a dearth of bayonets, a want of at least 2000 muskets; the artillery was poor and was chiefly gathered from accidental sources. There was no store of powder.

On pages 15 and 17, Vol. V, Bancroft records:

The camp contained a people in arms rather than an army. No one could tell precisely its numbers or the state of its stores. The soldiers had listed under different agreements and for periods indefinite but short. Each colony had its own rules of military government and its own system of supplies; and the men, chiefly freeholders and sons of freeholders, held themselves bound only by a specific covenant, of which they interpreted the conditions. . . . . Some of the soldiers demanded their pay on the basis of lunar months. . . . . The mothers, wives or sisters of the soldiers were constantly coming to the camp with supplies of clothing and household gifts. Boys and girls, too, flocked in with their parents from the country to visit their kindred, and gaze on the emblems and terrors of war. Eloquent chaplains kept alive the habit of prayer and preached the wonted sermons on the day of the Lord. The habit of inquisitiveness and self-direction stood in the way of military discipline: the men never learned implicit obedience and knew not how to set about it; between the privates and their officers there prevailed the kindly spirit and equality of life at home.

In February, 1776, Washington wrote to Congress declaring that his army consisted largely of "fleeting bands of undisciplined men, ill-clad and poorly armed."

And these land forces were almost as badly off in equipment as they were in organization and discipline, for Bancroft records that "except a little powder in a magazine near Williamsburg, it [Virginia] was destitute of warlike stores," while "not 500 pounds of powder was in the city of New York," and Massachusetts "had hardly ammunition enough for a parade day."

Speaking of the army before Boston, Bancroft says (Vol. IV, p. 541-542):

As for artillery, it was found, on inquiry, that there were altogether no more than six 3-pounders and one 16-pounder in Cambridge, besides sixteen pieces in Watertown, of different sizes, some of them good for nothing. But even these were more than could be used. There was no ammunition but for the six 3-pounders, and very little for them. In the scarcity of powder the most anxious search was made throughout the colony [Massachusetts]; and after scouring the five principal counties, the whole amount that could be found was less than 68 barrels. The other colonies, to which the most urgent entreaties were addressed for a supply, were equally impoverished.

Another weakening feature found in our land forces and scarcely known among our sailors was that of desertion, not only while on the march, but in the face of the enemy. Speaking of Montgomery's invasion of Canada in November, 1775, Bancroft says (Vol. IV, p. 130): "Homesickness so prevailed [among the

troops] that he [Montgomery] was left with no more than 800 men to garrison his conquests and to go down against Quebec. Even most of the Green Mountain Boys deserted him"; and in reference to Montgomery's subsequent attack on Quebec, Bancroft records: "As the time for the assault drew near three captains in Arnold's battalion, whose terms of service were soon to expire, showed mutinous disaffection. . . . . A deserter to the garrison" revealed to the defenders of Quebec the time and plan of Montgomery's assault on that stronghold which largely contributed to the disastrous termination of the attack.

That our land forces were far behind their brethren on the sea in the arts of maintaining a sanitary condition among a body of men confined in a small space (or even in the open) was sadly demonstrated in the retreat of Montgomery's remnant of an army from Canada. Early in July, 1776, the army reached Crown Point and Bancroft says (Vol. V, p. 357):

> The scene of distress produced a momentary despair. Everything about them, their clothes, their blankets, the air, the very ground they trod on, was infected with pestilence. "I did not look into a tent or a hut," says Trumbull, "in which I did not find either a dead or dying man." Of about 5000 men housed under tents, or rudely built sheds or huts of brush, exposed to the damp air of night, full half were invalids; more than 30 new graves were made every day. In a little more than two months, the northern army lost by desertion and death more than 5000 men.

III. COLONIAL DEPENDENCE ON THE SEA.

In these days when transatlantic passenger and freight service has been reduced to a ferry schedule; when the cable, the telegraph and the wireless have rendered intercontinental transmission of news almost instantaneous; when modern methods of preserving meat and other edibles have made it possible for man to exist in almost any part of the world, it is difficult for us to appreciate the dependence of the colonists on commerce. Homespuns and cured skins kept out the cold but they were not the clothing long to be tolerated by a highly intelligent people, so, with the almost total absence of manufacturers, the importation of cloth and other commodities of a civilized race became a necessity.

Not the least of household necessities in those days was salt (then imported exclusively from England), the price of which at that period reached as high as $28 a barrel. There were scores of other articles of daily use which could not be obtained in the

colonies except by importation, but this single illustration of salt (then the general means of preserving meat) fairly represents their importance.

As the first overt acts of resistance to motherland developed into open rebellion, we find that the colonists became more and more dependent on sea communications. "Some foreign commerce," wrote Bancroft (Vol. V, p. 142) "was required for the continuance of the war; the Americans had no magazines to replenish their little store of powder, no arsenals to furnish arms; their best dependence was on prizes, made under the pine-tree flag by the brave Manly and others who cruised in armed ships with commissions from Washington; even flints were obtained only from captured store-ships." The very tents that gave partial shelter to our soldiers entrenched before Boston in the winter of 1775-'76 were made from sails collected in American seaports.

On November 29, 1775, the little cruister *Lee* of Massachusetts entered Cape Ann Roads with her prize the *Nancy*, laden with 2000 muskets and bayonets, 8000 fuses, 31 tons of musket shot, 3000 shot for 12-pounder cannon, several barrels of powder and other munitions of war. In the following spring the *Franklin* brought in the store-ship *Hope* with her cargo of 1500 barrels of powder, a large quantity of entrenching tools and many gun-carriages—all of which were forwarded to our forces before Boston.

One of the first important captures of military supplies in this war was that made by a party of daring sailors who sailed from Philadelphia, overpowered the garrison at Hamilton, Bermuda, and returned with all the powder, arms and other military supplies stored in that place; and early in the spring of 1776 Captain Esek Hopkins' squadron captured New Providence in the Bahamas and reached New England with Governor Brown as a prisoner (afterward exchanged for "Lord" Stirling) besides 80 cannon, 15 barrels of powder and a quantity of other military stores.

As might be expected, these captures at sea, acceptable and important as they were in the emergency, could not be depended upon to adequately supply several armies in the course of a seven years' war. For this reason Congress sent Benjamin Franklin, Silas Deane and Arthur Lee to France and Spain to negotiate for regular supplies, to be transported to America; first from Nantes and Bilboa, until the British Ambassadors to France and Spain

compelled a discontinuance of this violation of "alleged" neutrality, and then from Dutch and other ports in the West Indies.

But even in this important move, as can be seen plainly, our sea forces were indispensable, not only in providing transport for our agents to and from Europe or to friendly ports in the West Indies from which they took passage in neutral vessels to France or Spain (and also in carrying cargoes of rice, tobacco, furs and other products on the safe delivery of which payment for these military supplies was based), but in transporting these munitions of war back to America. "During the summer of 1775," records Bancroft (Vol. V, p. 49), "ships were boarded off Savannah River and St. Augustine and more than 20,000 pounds of gunpowder were acquired. The export of rice was allowed on no other terms than that it would be exchanged for arms and ammunition, which were obtained from Hispaniola and from the French and Dutch islands" in the West Indies.

How sensible the British ministry was of the importance of cutting off this foreign supply of military stores to American land forces is fully shown by Bancroft when he records (Vol. IV, p. 63):

> While providing for reinforcements to its army, England enjoined the strictest watchfulness on its consuls and agents in every part of Europe, to intercept all munitions of war intended for the colonies. To check the formation of magazines on the Dutch island of St. Eustatius [in the West Indies], which was the resort of New England mariners, the British envoy, with dictatorial menaces, required the Staates-general of Holland to forbid their subjects from so much as transporting military stores to the West Indies beyond the absolute want of their own colonies. Of the French government, preventive measures were requested in the most courteous words.

Reinforcing these diplomatic strokes with material support, England, from 1776 to 1779, when her relations with France were strained to the point of rupture, massed the bulk of her great naval power off the coasts of the rebelling colonies and in the West Indies in an effort to cut off the supply of arms and munitions of war which was being carried into American ports. It was through these meshes of inimical diplomacy and hostile war craft that our brave seamen had to force their way (and with extraordinary success, too) in their efforts to supply our land forces with the absolutely necessary means for continuing an armed existence in the field.

IV. AMERICANS A MARITIME PEOPLE.

Naturally, we look for some explanation of the extraordinary preparedness for immediate service on the part of our sea forces (not only at the outbreak of the Revolution, but all through the seven years of that struggle) and the too evident unpreparedness, and even inaptitude for military service, of our land forces during the same period.

This explanation is had in the fact that the American colonist came almost exclusively from the greatest seafaring races the world had then seen. At the time Columbus discovered America, the Spaniards and Portuguese were the leading navigators of the world; many of their people settling in the North American colonies, the Spanish mostly in Florida, Georgia and the present Gulf States and the Portuguese in what is now Maine. The French and Dutch also were bold and skilful seamen, the former settling in Canada, Louisiana and along the Great Lakes, while the Dutch located on the shores of the Hudson and Connecticut Rivers. Then we have the Scandinavians and English, each being identified with some of the greatest maritime exploits in history.

In these days of enlightenment it is difficult for us to appreciate the old-time " dread of that mysterious " ocean. It took Columbus many years to " drum it into the heads " of the wisest statesmen of his day that it was possible for the earth to be round and that " people in Cathay could stand upside-down without falling off the earth." The belief was then general that the earth was flat and if one sailed too far, the craft and all aboard would tumble over some gigantic cascade and be swept into eternity.

This real fear of the sea is well described in Avery's history (Vol. I, pp. 67-68) when he says:

> The story goes that eight Arabs built a boat, provisioned it for a voyage of several months and fearlessly sailed from Lisbon directly out into the Sea of Darkness. This dreaded watery waste with its fabled monsters was a " vast and boundless ocean on which ships dare not venture out of sight of land, for, even if they knew the direction of the winds, they would not know whither those winds would carry them, and, as there is no inhabited country beyond, they would run great risk of being lost in mist and vapor." Here was the home of the monster with the ox's head, with knobbed scales and with hatred for all Christians. Here was Demogorgon with hurricanes and destruction flowing from his mouth. Here Sinbad's gigantic roc seized its white-winged prey and soared aloft with ship and crew into the upper air. Here Satan's black and horrid hand reached

forth from ocean depths to seize and to destroy any one who ventured to intrude.

It required men and women of the highest courage to overcome these superstitions pertaining to the sea, and it required even greater courage to face the real perils of the sea; and the result was that only the bravest of these men and women belonging to preeminently maritime races, crossed the Atlantic and settled in the wilds of America.

Having successfully made the venture the colonists soon acquired a familiarity and even fondness for the sea, and all that pertained to it, which afterward assisted them so powerfully when fighting for their independence. It was in " cargoes that came across the sea " that the colonist found his necessary supplies and it was to the arrival of these ships that they eagerly looked for news from homelands. It was on the water that they depended for a considerable portion of their sustenance and, owing to the difficulty of cutting roads through boundless forests and bridging innumerable rivers, chasms and swamps, intercolonial communication was mainly carried on by water craft. Nearly all the first settlements were established on rivers or around irregularly formed bays so that communication between some of the houses in the same village was more conveniently had by boats.

Under such fostering conditions it is not strange that we find the North American colonists (blending the several distinctively nautical strains in their blood into a new, composite people) developed into the most daring, skilful and enterprising maritime race the world has ever seen. Edmund Burke recognized the amazing nautical capacity of the Americans when he said, in a speech in Parliament at the time of our Revolution:

As to the wealth which the colonies have drawn from the sea by their fisheries, you had all that matter fully opened at your bar. And pray, sir, what in the world is equal to it? Pass by the other parts and look at the manner in which the people of New England have of late carried on the whale fishery. Whilst we follow them among the tumbling mountains of ice and behold them penetrating into the deepest frozen recesses of Hudson's Bay and Davis's Straits, whilst we are looking for them beneath the arctic circle, we hear that they have pierced into the opposite region of polar cold, that they are at the antipodes and engaged under the frozen serpent of the south. Falkland Island, which seemed too remote and romantic an object for the grasp of national ambition, is but a stage and resting-place in the progress of their victorious industry. Nor is the equinoctial heat more discouraging to them than the accumulated winter

of both poles. We know that, whilst some of them draw the line and strike the harpoon on the coast of Africa, others run the longitude and pursue their gigantic game along the coast of Brazil. No sea but what is vexed by their fisheries. No climate that is not witness to their toils. Neither the perseverance of Holland, nor the activity of France, nor the dextrous and firm sagacity of English enterprise ever carried this most perilous mode of hard industry to the extent to which it has been pushed by this recent people; a people who are still, as it were, but in the gristle and not yet hardened into the bone of manhood.

Nearly half a century later Daniel Webster depicted the pre-eminently maritime characteristics of the American people in a speech before Congress in these remarkable and prophetic words:

If war you must have [War of 1812], go to the ocean. If you are seriously contending for maritime rights, go to the theatre where alone these rights can be defended. Thither every indication of your fortunes points you. Even our party divisions, acrimonious as they are, cease at the water's edge. They are lost in the attachment to the national character on that element, where that character is made respectable. In protecting naval interests by naval means you will arm yourselves with the whole power of national sentiment, and may command the whole abundance of national resources. In time you may enable yourselves to redress injuries in the place where they may be offered and, if need be, to accompany your own flag throughout the world with the protection of your own cannon.

V. ENGLAND'S VALUATION OF OUR SEA FORCES.

Possibly the most remarkable feature of the extraordinary services rendered by our sea forces during the Revolution was the superb audacity and astounding success with which they carried the war "into the enemy's country." American historians, in their general histories of the United States, have given from ten to fifty times more notice to the operations of our armies than they did to our war craft, but a careful review of "petitions direct to the throne," memorials to the ministry, speeches in Parliament and contemporaneous English periodicals and publications shows conclusively that our sea forces occasioned, perhaps, "from ten to fifty" times more consternation and acute anxiety in the "tight little island" than our land forces did.

It can be conservatively stated that when the British ministry, backed by an obstinate king, forced the colonies into rebellion, they little thought that they were inviting danger to their very doors. Their idea of "crushing" the refractory Americans into obedience was a somewhat expensive transportation of German mercenaries across the Atlantic where the "difficulty" would be

speedily adjusted in the "wilds of the New World," far removed from any possibility of interfering with British interests in other quarters of the globe. The cost of this transportation, the ministers calculated, would be more than balanced by English merchants securing more of the carrying trade of the world. Long before hostilities broke out, the British ship owner had felt and loudly complained of the competition of their transatlantic cousins and, in spite of the Navigation Acts (which Parliament devised for the expressed purpose of "smothering" this competition) the colonial skipper was getting more of this trade than the British ship masters deemed fair.

It was with some degree of complacency, therefore, that English commercial circles looked forward to the war. But when they found that their craft, cargoes and crews were being captured, not only in distant seas, but in the very chops of the English Channel, in the waters of the Irish Sea and in the firths of Scotland, they were touched in their most sensitive spot—their pockets. Then arose a vehement protest against "this American war that is wrecking our fortunes" and the money class—then all-powerful in England—was enlisted in a campaign against its continuance; not because the war was being carried on in a brutal manner against a brave and spirited people struggling for their birthright, but because that war was resulting so disastrously to the English mercantile exchequer.

When England countenanced the destruction of Falmouth (now Portland, Me.) and Norfolk, Va., by ruthless burning, when she condoned the predatory expeditions which seized silver plate and other valuables of the colonists, when she failed to reprove her troops for destroying the homes of private citizens, she little thought that she was inviting a similar tribulation to her own shores. Yet the daring of Connyngham, Wickes, Jones and others caused her to realize that those "rebels" had arms long enough to reach across the Atlantic and deliver effective blows at her very doors. When England found that shipping in her own harbors was burned by the "impudent Yankee," that it was not safe for peers of the realm to dwell in their coast-wise country seats, when wealthy yeomen buried their family plate lest it be seized by those "piratical sailors headed by one Jones," she began to think far more seriously about the war.

Referring to the effect produced in England by the daring cruise of Connyngham in British waters in 1777, Silas Deane

wrote to the Marine Committee (Sparks' Diplomatic Correspondence):

It effectually alarmed England, prevented the great fair at Chester, occasioned insurance to rise, and even deterred the English merchant from shipping goods in English vessels at any rate of insurance. So that in a few weeks forty French ships were loaded in London on freight—an instance never before known.

British merchants even asked for the escort of war ships in the few hours' run from England to Ireland. The *Gentleman's Magazine* (an English publication), in its issue of July, 1779, records:

In no former war, not even in any of the wars with France and Spain, were the linen ships from Ireland to England escorted by war ships.

Fully appreciating the important part our sea forces were playing in the struggle, Dr. Franklin, writing from Paris, May 26, 1777, to the Committee on Foreign Affairs (see Sparks' Diplomatic Correspondence), said:

I have not the least doubt but that two or three of the Continental frigates sent into the German ocean, with some less swift-sailing craft, might intercept and seize a great part of the Baltic and Northern trade. One frigate would be sufficient to destroy the whole of the Greenland whale fisheries and take the Hudson Bay ships returning.

More forcible still is the testimony of the British themselves as to the consternation wrought in England by our sea forces. In its issue of August, 1812, the *London Statesman* says in reference to our Revolution:

Every one must recollect what they did in the latter part of the American war. The books at Lloyd's will recount it and the rate of assurances at that time will clearly prove what their diminutive strength was able to effect in the face of our navy; and that when nearly one hundred pennants were flying on their coast. Were we able to prevent their going in and out, or stop them from taking our trade and our store ships, even in sight of our own garrisons? Besides, were they not in the English and Irish channels picking up our homeward bound trade, sending their prizes into French and Spanish ports, to the great terror and annoyance of our merchants and ship owners?

These are facts which can be traced to a period when America was in her infancy, without ships, without money, and at a time when our navy was not much less in strength than at present. The Americans will be found to be a different sort of enemy by sea than the French. They possess nautical knowledge, with equal enterprise to ourselves. They will be found attempting deeds which a Frenchman would never think of, and they will have all the ports of our enemy open, in which they can make good their retreat with their booty. In a predatory war on commerce

Great Britain would have more to lose than to gain, because the Americans would retire within themselves, having everything they want for supplies, and what foreign commerce they might have would be carried on in fast-sailing, armed vessels which, as heretofore, would be able to fight or run, as best suited their force or inclination.

We get some idea of the amazing activity of our sea forces in British home waters from the *Edinburg Advertiser* in its issue of April 13, 1779, which contains notices of four actions between American and Scotch craft fought off the Irish coast within two weeks; and on the very day the last of these actions was fought (off the harbor of Cork March 28, 1779), the Yankee 20-gun privateer *General Arnold,* commanded by Moses Brown (afterward a captain in our navy), had a severe action with the Liverpool letter of marque *Gregson* of equal force off St. Michael's of the Western Isles—the enemy sustaining a loss of 18 killed and a proportionate number wounded. And fewer than seven weeks after this the *General Arnold* captured the English privateer *Nanny,* after one of the most spirited single-ship actions of the war, off Cape Finisterre.

From the *London Remembrancer* of 1777 we get another illustration of the astounding audacity of our privateersmen:

An American privateer of twelve guns came into one of the ports of the Jersey Islands, in the English Channel, yesterday morning, tacked about on the firing of the guns from the castle and, just off the island, took a large brig bound for this port, which they have since carried into Cherbourg. The American privateer had the impudence to send her boat in the dusk of the evening to a little island off here called Jetto, and unluckily carried off the lieutenant of Northley's Independent Company with the garrison adjutant, who were shooting rabbits for their diversion. The brig they took is valued at thirty-five thousand dollars.

Not only in the citadel of England's maritime strength did our gallant sailors carry the war for independence, but they waged it with equal effect against her distant dependencies as is most conclusively shown in the following extracts (see *London Remembrancer* of 1777) from letters written by Englishmen. One letter written from Jamaica in 1777 records: "Within one week upward of fourteen sail of our ships have been carried into Martinique by American privateers," while another letter from Grenada, written about the same time, declares:

Everything continues exceedingly dear and we are happy if we can get anything for money, by reason of the quantity of vessels taken by the Americans. A fleet of vessels came from Ireland a few days ago. From

sixty vessels that departed from Ireland not above twenty-five arrived in this and neighboring islands, the others, it is thought, being all taken by American privateers. God knows, if this American war continues much longer we shall all die with hunger. There was a ship from Africa with four hundred and fifty negroes, some thousand weight of gold dust and a great many elephant teeth—the whole cargo being computed to be worth twenty thousand pounds—also taken by an American privateer, a brig mounting fourteen cannon.

These were the blows that aroused England to the seriousness of her conflict with the refractory Americans, these were the blows that "struck home." It was to stem the torrent of popular clamor and protest against "this annihilation of our commerce" that Parliament made a special investigation, not of the ravages by disease or loss by capture of British troops in America, but of the ravages being made in English commerce.

As a result of this investigation Alderman Woodbridge, on February 6, 1778, testified at the bar of the House of Lords, that "the number of ships lost by capture or destroyed by American privateers since the beginning of the war was 733 whose cargoes were computed to be worth over ten million dollars. That insurance before the war was two per cent to America and two and a half per cent to North Carolina, Jamaica, etc., but now that insurance had more than doubled, even with a strong escort, and without an escort, fifteen per cent." On his return from a cruise in the English Channel in 1776, Captain Bucklon, of Rhode Island, reported that the rate of insurance in England had risen to 30 per cent on vessels under convoy and for those sailing without escort, 50 per cent.

Another witness examined in the House of Lords in this "investigation" was William Creighton who said that "the losses suffered by British merchants in consequence of captures made by American privateers up to October, 1777, could not be short of eleven million dollars."

VI. LOYALTY OF OUR SEAMEN.

Lastly, but far from least, the loyalty of our seamen of the Revolution exerts a strong claim on the grateful record of the general histories of the United States. Not only as individuals, but collectively our sea fighters maintained a faith in the cause of freedom that forms a striking contrast to some conspicuous examples of treachery on the part of high army officers (such as

Charles Lee and Benedict Arnold) and to the wholesale desertions of our troops during the encampment at Valley Forge and other winter quarters—to say nothing of the companies and even regiments that were openly enlisted under the king's banner among the colonists.

There is no instance authoritatively recorded of any American sea officer deliberately betraying his trust and no instance of any considerable body of our sailors—certainly nothing approaching a "company" or "regiment"—deserting their colors in the face of the enemy. There were no "winter quarters" for our sailors in which to shelter themselves from the severe cold and in which to recuperate for the "summer campaigns," for records show that there were almost as many battles fought at sea in the winter months by our maritime forces during the seven years of the war as in any other one quarter of the year.

This remarkable loyalty is the more gratifying when we remember the special efforts made by the English to induce our seamen to serve under the royal standard. We have it in the words of Bancroft himself (Vol. V, p. 539):

> Every effort was made [by England] to gain recruits for the army and navy. Threats and promises were used to induce captive American sailors to enlist in the British service. "Hang me, if you will, to the yard-arm of your ship, but do not ask me to become a traitor to my country," was the answer of Nathan Coffin; and it expressed the spirit of them all.

In startling contrast to this we have Bancroft's statement that Delancy in New York enlisted 600 Americans and Cortland Skinner, of New Jersey, 500 to serve against their countrymen while the "Loyalists boasted that as many soldiers from the States were taken into the pay of the crown as the Continental Congress; and the boast, though grossly exaggerated, had some plausible foundation" (Bancroft, Vol. V, p. 544).

Extraordinary efforts were made by British authorities to induce American seamen, confined in the Wallabout prison ships, to serve the king and one of the objects the notorious David Sproats had in treating these prisoners with such brutality was to force them to escape from their "living death" by consenting to fight against their native land. It has been estimated that from 10,000 to 11,000 men perished in these "pest holes." David and Samuel Porter, besides many other high officers in the Continental and privateer service of the Revolution, were confined here; David

Porter (father of the hero of the frigate *Essex* in 1814) made his escape by concealing himself in a water cask that was being taken ashore to be filled, but his brother Samuel succumbed to the horrors of the place. From a letter written by Washington to Congress, dated February 18, 1782, we know that most of these martyrs were American sailors for Washington declared: "Few or none of these prisoners belonged to the regular cruisers of the colonies, most of them being captured privateersmen." Be it ever remembered to the honor of these seamen that most of them preferred having their bones bleached on the banks of the Wale Bogt in preference to serving against their country.

It may be said that there was a mutiny in the Continental frigate *Alliance* in 1779 and in our privateer *Jason* in the same year. The trouble in the first, however, was occasioned solely by British and French sailors—not by Americans—under the command of the eccentric Captain Pierre Landais, a Frenchman. The "mutiny," although planned, never reached the "breaking out" point. In the case of the *Jason* (then commanded by Captain John Manly, U. S. N.) the mutiny was suppressed in a manner that showed how discipline was maintained by our sea officers.

The affair is interestingly described in the diary of one Joshua Davis, a Boston hair-dresser's apprentice, who, catching the "privateering fever" enlisted in the *Jason*. After describing how this ship lost her masts in a squall off the southern coast of Maine, Davis says: "We got up jury masts and ran in between the Isle of Shoals and Portsmouth, where our captain was determined to take our masts in. In a few days Captain Manly went on shore to see to getting the masts on board. While he was gone Patrick Cruckshanks, our boatswain, Michael Wall, boatswain's mate, and John Graves, captain of the forecastle, went forward and sat down on the stump of the bowsprit and said they would not step the masts in such a wild roadstead to endanger their lives, but if the ship was taken into the harbor they would do it with pleasure. When Captain Manly came on board he asked Mr. Thayer why the people were not at work and was told that they wished to get into the harbor first. The captain answered, 'I'll harbor them,'" and stepped up to the sentry at the cabin door, took his cutlass out of his hand and ran forward and said:

"Boatswain, why do you not go to work?"

He [the boatswain] began to tell him the impropriety of getting the masts in where the ship then was, when Captain Manly struck him with

the cutlass on the cheek with such force that his teeth were to be seen from the upper part of his jaw to the lower part of his chin. He next spoke to John Graves and interrogated, and was answered in a similar manner, when the captain struck him with the cutlass on the head, which cut him so badly that he was obliged to be sent to the hospital with the boatswain.

The captain then called the others to come down and go to work. Michael Wall came down to him. The captain made a stroke at him, which missed and, while the captain was lifting up the cutlass to strike him again, Wall gave him a push against the stump of the foremast and ran aft. The captain made after him. Wall ran to the main hatchway and jumped down between the decks and hurt himself very much. The captain then, with severe threats, ordered the people to go to work. They went to work and stepped the masts, got the topmasts on end, lower yards athwart, the topsail yards on the caps, topgallant masts on end, sails bent, running rigging rove, boats on booms, etc., and all done in thirty-six hours.

VII. Summary.

Effort has been made in this article to show that campaigns at sea, during the American Revolution, were of a most important character; that being prepared for active service from the very start, our sea forces conducted their operations with a vigor and persistency to the close of that struggle that weighed heavily in the outcome; that the rebelling colonists were dependent on their sea forces for military supplies and other necessities in order to continue their fight on land; that Americans being a preeminently maritime race, were enabled to wage a most effective war against the common foe on the ocean; that England's most vulnerable point was her commerce, home interests and colonial dependencies which were assailed with astonishing daring and success by our seamen; and, finally, that there was a conspicuous absence of treachery or insubordination, individually or collectively, on the part of our mariners—in startling contrast to notorious examples of betrayal and disloyalty on the part of some army officers and large bodies of troops.

If these claims have, in any degree, been established in this article, then it certainly must be conceded that our sea forces in the American Revolution are entitled to far more than one-tenth (and, in the case of Bancroft's work, one-fiftieth) of the space allotted in the general histories of the United States to the military operations on land and sea during our struggle for independence.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EARLY NAVAL VOYAGES TO THE ORIENT.

By Charles Oscar Paullin.

XI.

The Voyages to Japan of Commodore Biddle and Commander Glynn: 1846, 1849.[1]

A half century after the Europeans began to navigate the Indian Ocean about the year 1500, the Portuguese and Spanish opened up a considerable trade with Japan. They were soon followed by the Dutch and English, who by the first part of the seventeenth century had almost monopolized the commerce between Japan and the Occident. In the meantime Roman Catholic missionaries had entered the land of the Mikado and were pursuing their calling with their usual zeal and bigotry. Finally, after welcoming the aggressive Westerners for upwards of a century, Japan entered upon a policy of non-intercourse with them, largely as a result of the strife engendered by the missionaries. In 1621 she forbade her citizens to visit foreign countries, and three years later she banished from her domain all Westerners, with the exception of the English and the Dutch. Twenty years later she limited her Western trade to the Dutch, and permitted them to visit only the island of Deshima, near Nagasaki. Here the Dutch erected a factory and established a small settlement, which was presided over by a general agent or superintendent. The natives were forbidden to visit the island, and the foreigners were not allowed to cross the small bridge which connected it with

[1] See East India Squadron Letters, 1845-1847, 37, 60-62; 1848-1850, 124-129, 194-263; Sen. Doc., No. 59, 32 Cong., 1 sess.; Nitobe, I. O. The Intercourse between the United States and Japan, 7-37; Chinese Repository, VI, 209-229, 353-380; XV, 172-180; XVIII, 315-332; Logs of the *Columbus*, *Vincennes* and *Preble*, U. S. Navy Department Archives; Proceedings of the United States Naval Institute (Annapolis), XXXI, 555-563; The Independent (New York), LIX, 407-501, 1043-1044; and Nordhoff, Charles, Nine Years a Sailor, 194-208.

Nagasaki. At first the Dutch were granted permission to send eight ships annually to their factory, but in time this number was reduced to two, and finally to one.[1]

During the Napoleonic wars, the Dutch, in order to avoid exposing their own vessels to capture by British cruisers, employed neutral ships to make the annual voyages to Deshima. It was owing to this practice that some of our merchantmen were afforded an opportunity to visit Japan—the first American ships to enter the waters of the Mikado. During the years 1797-1809, the Dutch hired no less than eight American vessels to make voyages from Batavia to Deshima: the *Eliza*, of Boston, Captain W. R. Stewart; *Franklin*, of Boston, Captain J. Devereux; *Massachusetts*, of Boston, Captain W. V. Hutchings; *Margaret*, of Salem, Captain Samuel Derby; *Samuel Smith*, Captain G. Stiles; *Rebecca*, Captain J. Deal; *America*, Captain Henry Lelar; and *Mount Vernon*, Captain J. Davidson. In Japanese waters these ships sailed under the Dutch flag, as otherwise they would not have been permitted to conduct the Dutch trade. The first account of Japan from the pen of an American was written by Mr. George Cleveland, the captain's clerk of the *Margaret*. The first two voyages were made by the *Eliza* in 1797 and 1798.

The captain of the *Eliza*, W. R. Stewart, appears to have been a shrewd Yankee, with a sharp eye for the main chance, for after completing his contract with the Dutch, he in 1803 sailed boldly into Nagasaki, under the American flag, with a cargo purchased in Bengal and Canton. He asked the Japanese permission to trade and to obtain some water and oil. The first request was positively refused, but the second was granted; and, after his wants had been supplied, he was ordered to depart. Four years later another American vessel, the *Eclipse*, visited Nagasaki, under circumstances that aroused the suspicion that she came to trade, rather than to obtain refreshments, professedly her object. She too was denied the rights of commerce, and on being furnished with provisions was permitted to continue her voyage. During the thirty years immediately succeeding the visit of the *Eclipse*, our merchantmen seem to have respected the desire of the Japanese to be left alone.[2]

[1] Nitobe, I. O., The Intercourse between the United States and Japan, 7-25; Adams, F. O., The History of Japan, I, 69.

[2] Doeff, H., Herinneringen uit Japan, 61-62, 153-157; Chinese Repository, X, 162.

The first American whale ship to enter Japanese waters made its appearance off the coast of Japan in 1820. In the following year some six or seven of these venturesome craft cruised there, and in 1822 more than thirty. It is highly probably that the early whalers sought refreshments on shore or anchored in some sheltered port to escape heavy weather.[4]

In 1837 the American firm of Olyphant and Company, of Canton, made an attempt to induce the Japanese to relax their exclusive commercial policy. It decided to transport to Japan some ship-wrecked subjects of the Mikado who had been brought to Macao, and to avail itself of the opportunity thus afforded for producing a favorable impression upon the Japanese government. The expedition was placed in charge of Mr. Charles W. King, an American merchant, and the American ship *Morrison*, Captain David Ingersoll, was chosen to make the voyage. For purposes of trade, a small assortment of cloth, adapted to the Japanese taste, was put on board, and several presents illustrative of the American civilization were added. As the object of the voyage was a peaceful one, the guns of the *Morrison* were removed. The expedition first proceeded to Yedo Bay, where it was fired on by the batteries on shore, and was not permitted to communicate with the government at Yedo. Thus foiled, it sailed southward to the bay of Kagoshima, and there it met with a similar reception. Forced to abandon its mission, it returned to China with the shipwrecked sailors, who on witnessing the hostile temper of their countrymen did not care to land.[5]

In 1846 a voyage similar to that of the *Morrison* was made by Captain Mercator Cooper, of the whaler *Manhattan*, of Sag Harbor, Long Island. While on a cruise to the whaling regions of the North Pacific, Cooper landed at St. Peter's Island, a few degrees southeast of Japan, and found there eleven shipwrecked Japanese sailors. He offered to convey them to their native land, and they gladly consented to go. On his way thither he rescued eleven more Japanese from a floating wreck. Arriving on the coast of Japan, he sent messengers to inform the Emperor of the object of his visit and of his desire to enter the harbor of Yedo. The Emperor gave his permission to visit the capital, and

[4] Davis, J. F. China during the War and since the Peace, II, 281; King, C. W., and Lay, G. T., The Claims of Japan and Malaysia upon Christendom, I, 75.

[5] Chinese Repository, VI, 209-229, 353-380.

on his arrival there treated him with much civility, supplying him with wood, water and provisions, and making him a present of some Japanese crockery, some lacquered ware and a specimen of the Emperor's writing. Cooper and his crew were forbidden to leave their ship and were commanded never to come again to Japan. He held several conversations with the governor of Yedo and other officials of rank, and after a stay of four days, having landed the shipwrecked sailors, left the bay.[6]

The first voyages of our merchantmen to Japan preceded by several years the first voyage of our national vessels. The earliest connection between the navy and Japan, if we may accept the authority of De Bow's Review, may be seen from the following item extracted from this journal for December, 1852: "This [expedition to Japan] has been long in contemplation by our government. Com. Porter, as far back as 1815, addressed a letter to Mr. Monroe [Secretary of State] on the subject, and it was then intended to send out Com. Porter with a frigate and two sloops of war, but the plan was defeated." Unfortunately this quotation, so far as it refers to Porter, stands unverified, and there is much doubt whether that officer ever proposed such an expedition.[7]

The first official action of the United States respecting Japan was taken in 1832 when Mr. Edmund Roberts, who had been ordered by the State Department to negotiate treaties with the rulers of Cochin China, Siam and Muscat, was authorized to institute a separate mission to Japan, provided he found the "prospect favorable." Should the mission be instituted, he was to take passage in a coasting vessel, under convoy of the sloop *Peacock*, since, to make the voyage in a ship of war would subject him to the indignity of having his vessel disarmed, in accordance with Japanese custom. For some reason, he decided not to make the proposed visit.

In 1835, when about to leave Washington on his second embassy to the Orient, Roberts was directed to go to Japan and attempt to open negotiations for a treaty with the Emperor of that country. The entering of some other port than Nagasaki, the Japanese permitting, was recommended, as the Dutch had an establishment there and they might feel themselves interested in thwarting him. In case he obtained a treaty, permission was

[6] Chinese Repository, XV, 172-179.
[7] De Bow's Review (New Orleans), XIII (1852). 560.

granted him to give the Japanese presents to the value of ten thousand dollars. He was furnished with a letter from President Jackson addressed to the Emperor and with numerous gifts, including a gold watch with a heavy gold chain eight feet long, a sabre, rifle and shot-gun, a pair of pistols, an assortment of broadcloth, some cut glass, a music box, some maps, a set of American coins, prints of American naval victories, and ten Merino sheep of the finest wool. On the death of Roberts in 1836, soon after reaching Macao, the Japanese mission was abandoned.[8]

The American missionaries and merchants in China early recognized that Japan offered a promising field for their activities, and were greatly interested in the measures proposed for the opening of that country to the outside world. They, in all probability, brought to bear their views on Commissioner Caleb Cushing during his six months' stay in China. However that may be, it was inevitable that so sagacious a diplomat as Cushing should, on making a treaty with China, conceive the idea that Japan might be induced to follow the example of her neighboring empire. He communicated his views on this subject to President Polk, who, although believing that the probability of effecting a commercial arrangement with Japan was small, authorized John C. Calhoun, the Secretary of State, to transmit to Cushing full powers to treat with the Japanese government. Cushing left China before he received Calhoun's letter, and the duty of undertaking the mission developed upon Alexander H. Everett, his successor as commissioner to China. Owing to sickness, Everett transferred his powers to Commodore James Biddle, who, however, was otherwise authorized to visit Japan, as may be seen from the following extract taken from his sailing orders dated May 22, 1845:

> You will hold the squadron at the disposal of the Commissioner, for the purpose of conveying him to any part of the coast of China or Japan, which he may have occasion to visit in the execution of his instructions. . . . . In an especial manner you will take the utmost care to ascertain if the ports of Japan are accessible. Should the Commissioner incline to make the effort of gaining access there, you will hold your squadron at his disposition for that purpose; and should he decline to do so, you may yourself, if you see fit, persevere in the design, yet not in such a manner as to excite a hostile feeling or distrust of the Government of the United States.[9]

[8] Foster, J. W., American Diplomacy in the Orient, 140 141; Sen. Doc., No. 59, 32 Cong., 1 sess., p. 63.

[9] Confidential Letters, U. S. Navy Department Archives, I, 126.

Biddle was one of the oldest and most distinguished officers of the navy, his name being seventh on the navy list of 1845. He was a nephew of Captain Nicholas Biddle, who lost his life during the Revolutionary War by the blowing up of his ship, the frigate *Randolph*, during an engagement with the British vessel *Yarmouth*. Young James entered the navy in 1800. In the war with Tripoli he served as a midshipman on board the *Philadelphia* and was imprisoned at Tripoli on the capture of that vessel. In the War of 1812 he was a lieutenant on the *Wasp* when she captured the *Frolic*, and the commander of the *Hornet* when that vessel took the *Penguin*, receiving for the latter victory a gold medal from Congress. After the War of 1812 he took possession of the country bordering on the Columbia River in behalf of the United States, and he served as one of the representatives of his government in negotiating its first treaty with Turkey.

Biddle's little squadron consisted of the ship of the line *Columbus*, the only vessel of that class to visit the Far East, and the sloop of war *Vincennes*, Captain Hiram Paulding, now making her fourth cruise to the Orient. On this voyage the *Columbus* sailed sixty-nine thousand miles, establishing a record for a ship of her class. On her return home she was laid up in ordinary at the Norfolk navy yard, where she remained until the outbreak of the Civil War, when she was scuttled and sunk to prevent her from falling into the hands of the Confederates.

Biddle's duties in China, which have been described in the previous chapter, occupied him several months, and the summer of 1846 had arrived before he was ready to visit Japan. On July 7 he sailed with both vessels from the Chusan Islands, near Shanghai, for Yedo, which port he had decided to enter in preference to Nagasaki, where such opposition as the Dutch might offer would have to be encountered. On the 19th, on approaching Yedo Bay, he passed several Japanese junks, which gave him a wide berth, and on the following day he entered the bay, carefully picking his course by means of soundings and a lookout. When some twenty-five miles from Yedo, a Japanese officer, accompanied with a Dutch interpreter, boarded the flagship and motioned to the commodore that he had gone far enough. Not wishing to give offense, Biddle anchored at the place pointed out, which was on the south side of the bay, abreast a village. The adjacent country was beautifully green, and appeared to be well cultivated.

As soon as Biddle had anchored, he was surrounded by numerous boats, and many Japanese came on board the ships, a freedom that he permitted in order to convince them of his friendship and of his ability to defend himself.

Soon after the officer boarded the *Columbus*, he held a conference with the commander-in-chief. "He inquired what was was my object in coming to Japan," Biddle wrote to the Secretary of the Navy, "I answered that I came as a friend to ascertain whether Japan had, like China, opened their ports to foreign trade; and if she had, to fix by treaty the conditions on which American vessels should trade with Japan. He requested me to commit this answer to writing, and I gave him a written paper, a copy of which is herewith transmitted. He informed me that any supplies I might require would be furnished by the government. To my inquiry whether I would be allowed to go on shore, he replied in the negative." [10]

On the morning of the 21st another officer, apparently of higher rank, came on board the flagship. "He stated," said Biddle, "that foreign ships upon entering a port of Japan always landed their guns, muskets, swords, etc. I told him it was impossible for us to do so, that trading vessels only could be expected to do so, and I assured him that we were peaceably disposed, so long as they were. He informed me that my written paper of the preceding day had been transmitted to the Emperor, who was some distance from Yedo, and that an answer would be received in five or six days. I asked him why we were surrounded by boats, and he replied that they might be ready in case we wanted them to tow the ship. This, of course, was not true; the object, of course, being to prevent our communicating with the shore. When our boats were sent to sound at some distance from the ship, Japanese boats followed them, without, however, molesting them. During our whole stay these boats continued about the ship. I had on board copies, in Chinese, of the French, English and American treaties with China. I offered these treaties to the Japanese officer, who declined receiving them, saying that he could not receive them without the permission of his Emperor. I offered these treaties subsequently to other Japanese officers, who in like manner declined to receive them."

[10] For Biddle's account of his visit to Japan, see Sen. Doc., No. 59, 32 Cong., 1 sess., pp. 64-66.

The Japanese furnished the fleet with wood, water and provisions, refusing in accordance with their customs to accept remuneration. In watering the ships they at first sent off only small quantities. Annoyed by their procrastination, Biddle said to one of the officers that if they did not water the ship properly he would obtain a supply by sending his boats ashore. This threat had the desired effect, bringing forth an abundance of water. Concerning the eatables supplied by the Japanese, Mr. Charles Nordhoff, first-class boy on the *Columbus*, wrote thus:

An intimation having been given that some fresh provisions would be highly desirable, two large junks made their appearance from the upper harbor, bringing to us a supply of vegetables of various kinds and several hundred chickens. Among the vegetables were sweet potatoes, egg plants, carrots, and pumpkins. There was also a quantity of small green apples, the first we had seen since leaving home.[11]

On the 25th Biddle, not having received an answer to the paper sent on shore five days previous, expressed his surprise to one of the Japanese officers at the delay, and requested him to inform the governor of Yedo that he wished an answer as early as possible. On the 27th an officer, accompanied with a suite of eight persons, approached the flagship in a junk, bringing the reply of the Emperor, and asked the commander-in-chief to come aboard the junk to receive it. An unfortunate occurrence now took place, which rather reflects upon the discretion of Biddle, as may be seen from his own account:

I refused, and informed the interpreter that the officer must deliver on board this ship any letter that had been entrusted to him for me. To this the officer assented, but added, that my letter having been delivered on board the American ship, he thought the emperor's letter should be delivered on board the Japanese vessel. As the Japanese officer, though attaching importance to his own proposal, had withdrawn it as soon as I objected to it, I concluded that it might be well for me to gratify him, and I informed the interpreter that I would go on board the junk, and there receive the letter. The interpreter then went on board the junk. In an hour afterwards I went alongside the junk in the ship's boat, in my uniform; at the moment that I was stepping on board, a Japanese on the deck of the junk gave me a blow or push, which threw me back into the boat. I immediately called to the interpreter to have the man seized, and then returned to the ship. I was followed on board by the interpreter and a number of Japanese officers. They all expressed the greatest concern at what had occurred, stated that the offender was a common soldier on

[11] Nordhoff, Charles, Nine Years a Sailor, 205.

board, and assured me that he should be punished severely. They asked in what manner I wished him punished, and I replied, "according to the laws of Japan." I stated that the officers were greatly to blame as they ought to have been on deck to receive me. They declared that they had not expected me alongside, and I was subsequently convinced that, owing to bad interpretation, they believed my final decision had been that they were to come to the ship. I was careful to impress upon all the enormity of the outrage that had been committed, and how much they owed to my forbearance. They manifested great anxiety and apprehension, and endeavored in every way to appease me. In the course of the day, the governor of Yedo sent an officer to inform me that the man should be severely punished, and that he hoped that I would not think too seriously of the affair. The conduct of the man is inexplicable, especially as all the Japanese in and about the ship had evinced great good nature in all their intercourse with us."

The delivery of the Emperor's letter was finally made on board the *Columbus* by the Japanese officer, who was accompanied by the Dutch interpreter and his suite. The letter was without address, date, signature, or seal. These omissions indicated not so much disrespect for the Americans as an unwillingness to have official intercourse with them and a desire to discourage their return. The letter was partly written in Chinese, and partly in Japanese, in accordance with the reputed usage of Japan. It was enclosed in a cover upon which were the words "explanatory edict," a term applicable only to an act of the Emperor. As translated by the American legation at Canton, it read as follows:

The object of this communication is to explain the reasons why we refuse to trade with foreigners who come to this country across the ocean for that purpose.

This has been the habit of our nation from time immemorial. In all cases of a similar kind that have occurred we have positively refused to trade. Foreigners have come to us from various quarters, but have always been received in the same way. In taking this course with regard to you, we only pursue our accustomed policy. We can make no distinction between different foreign nations—we treat them all alike; and you, as Americans, must receive the same answer with the rest. It will be of no use to renew the attempt, as all applications of the kind, however numerous they may be, will be steadily rejected.

We are aware that our customs are in this respect different from those of some other countries, but every nation has a right to manage its affairs in its own way.

The trade carried on with the Dutch at Nangasacki is not to be regarded as furnishing a precedent for trade with other foreign nations. The place is one of few inhabitants and very little business, and the whole affair is of no importance.

In conclusion we have to say that the Emperor positively refuses the permission you desire. He earnestly advises you to depart immediately, and to consult your own safety by not appearing again upon our coast.[12]

When the substance of this admirably plain, clear and dignified statement of Japanese custom and polity had been translated to Biddle by the Dutch interpreter, he said to the officer that the United States wished to make a treaty with Japan, but not unless Japan also wished a treaty; that he came to Yedo for information on this subject; and that, having ascertained that the Japanese were not yet prepared to open their ports to foreign trade, he should sail on the following day. The officer asked Biddle to commit his answer to writing, a request that was readily granted.

On the morning of July 29, after an interesting stay of ten days in Yedo Bay, during which time hundreds of Japanese visited the *Columbus* and *Vincennes*, Biddle ordered the anchors to be weighed. To hasten his departure, several hundred native boats, the wind blowing light, towed the ships out to sea. He left the Japanese rejoicing at having rid themselves so easily of their unwelcome guests. The *Vincennes* returned to China, and the *Columbus* went to the west coast of America, which she reached in time to participate in the Mexican War.

Mr. Alexander H. Everett, the American commissioner to China, was of the opinion that Biddle's attempt to open negotiations with the Japanese "placed the subject in a rather less favorable position than that in which it stood before." Another eminent authority, Commodore Stephen B. Luce, a midshipman on the *Columbus*, takes the view that Biddle's courteous and conciliatory bearing toward the Japanese predisposed them to look with favor upon those Americans who subsequently visited their country. The statements of both Everett and Luce may be in a measure correct. In consenting to go aboard the junk, Biddle was evidently indiscrete, and the incident was used by the natives to discredit the Americans. On the other hand, the presence of an armed fleet in the bay of Yedo and Biddle's amicable and judicious relations with the Japanese officials gave them a favorable impression of the strength, candor and justice of the great Western republic. Biddle must be awarded the distinction that attaches to the pioneer, for he was the first American naval officer to anchor a fleet in the waters of Japan, to hold intercourse with the officials

[12] Sen. Doc., No. 59, 32 Cong., 1 sess., p. 68.

of that country, and to acquire a firsthand knowledge of its people and customs. Those who came after him had the advantage of his experience.[13]

After Everett's return home from Rio Janeiro in 1845, his health improved, and in the following year he went to China and entered upon his duties as commissioner. He was again granted power to negotiate a treaty with Japan, but died before an opportunity for exercising it presented itself. During the term of office of his successor, Mr. John W. Davis, an occasion arose for sending a national vessel to that country. Davis, on being notified by the consul of the Netherlands at Canton, on the authority of the Dutch superintendent at Deshima, that fifteen American sailors were imprisoned at Nagasaki, advised Commodore David Geisinger, the commander-in-chief of the East India squadron, to send a vessel to Japan to obtain the release of the prisoners. Accordingly, on January 31, 1849, Geisinger ordered the national ship *Preble,* Commander James Glynn, to proceed at once to Nagasaki and demand the surrender of the fifteen sailors and of any other Americans confined in Japan. In case he failed at Nagasaki, Glynn was to go to Yedo and communicate with the Imperial court respecting the sailors. He was directed to be "conciliatory, but firm," and to pay due respect to the Japanese laws and customs.

Glynn's voyage to Japan was the chief event of his naval career, which otherwise was not especially notable. He entered the navy from Virginia in 1815, and reached the grade of lieutenant in 1825, commander in 1841, and captain in 1855. In 1861 he was retired as captain, and four years before his death, in 1871, he was promoted to be commodore on the retired list. In February, 1848, he took command of the *Preble* at Callao, and in May sailed from San Blas for Macao, with Commodore Geisinger on board. The *Preble* was rated as a 16-gun sloop, and on her voyage to Japan carried one hundred and forty-one men.

The sailors, whose release Glynn was ordered to obtain, had belonged to the American whaler *Lagoda,* Captain John Brown, of New Bedford. In June, 1848, they deserted their vessel on the northwest coast of Japan, and after cruising along the shore several days, were arrested by some Japanese officers and taken to

[13] Sen. Doc., No. 59, 32 Cong., 1 sess., 15, 19, 69; Proceedings of the United States Naval Institute XXXI, 557.

Matsumai, where they were imprisoned. Thence in accordance with Japanese law, they were conducted to Nagasaki and confined there. They were suspected by the Japanese of being spies, and their repeated and often successful attempts to break jail confirmed the suspicion. During their imprisonment, which was somewhat rigorous, one of them hanged himself, and another died of fever. Mr. J. H. Levyssohn, the superintendent of the Dutch factory at Deshima, interested himself in the unfortunate men, relieving their most urgent wants and communicating a statement of their case to the Dutch consul at Canton. Five of the men were Americans and ten Sandwich Islanders.

The *Preble* sailed from Hong Kong on February 12, 1849, but was obliged soon to return to port owing to the appearance of small pox on board, and did not again go to sea until March 22. After calling at the Lu-chu Islands where she spent three days, she finally, on April 17, made land near Nagasaki. On the following day, having anchored some distance from the town, she was boarded by a Japanese officer, Moreama, accompanied with eigth "assistants." Moreama spoke English, and at once conferred with Glynn, who assumed a tone and manner that he maintained uniformly throughout his stay. Believing that Biddle's dealings with the Japanese had been too kindly and conciliatory, he decided to try the efficacy of rigorous firmness, cool assurance, and a severity of demeanor. When Moreama asked, "With all respect, may I be informed of your object in coming to Japan," Glynn evaded the question, saying that he came on important business with the government. To Moreama's next question, "Did you receive a paper?" Glynn replied: "No; one of your boats came alongside, and threw on the deck of this ship a bamboo stick, in which was stuck a paper. If this paper was intended for me, it was not the proper manner to communicate with me, and I ordered it to be immediately thrown overboard. I am ready to receive all communications which come to me in a proper and respectful manner." Moreama said that his purpose in boarding the ship was to acquaint its commander with the proper anchorage, which he pointed out on a chart. Glynn now raised objections, saying that his present anchorage and the one pointed out were unsafe, that in order to secure his ship in case of heavy weather it was necessary for him to anchor her inside the harbor, and that he intended, on the departure of his visitors, to get

under way and stand in. After parleying over the point for a time, Moreama yielded it, and the *Preble* was anchored in the harbor, abreast the island of Happenberg, below the town and the Dutch factory, with which places communication was by boat.[34]

At Nagasaki the arrival of Glynn caused great commotion. Some six thousand troops were assembled there, the forts of the town were strengthened with recruits, and a cordon of boats was placed around the *Preble* to prevent communication with the natives. Forbidden to visit the strange vessel in the harbor, the Japanese used the battlements of Nagasaki as a vantage-point from which to view her. Not the least excited of those on shore were the American prisoners, whose spirits revived at the prospect of release.

Soon after the ship reached her anchorage near the island of Happenberg, she was boarded by a "high military chief," Serai Tatsnosen, who was accompanied by Moreama as interpreter. After ascertaining that the visitor's rank and credentials were satisfactory, Glynn entered into conversation with him, answering his questions respecting the purpose of the mission and the character of the ship. The visitor also had some interesting information to impart, namely, that an American of whom Glynn had had no previous knowledge was confined at Nagasaki, and that two of the *Lagoda's* sailors were dead. He offered to furnish gratuitously any refreshments of which the *Preble* stood in need, but Glynn refused to accept them unless permitted to pay for them, which permission was refused.

On the 19th a second high military chief, Matsmora Schal, visited the American commander to present the compliments of the governor of Nagasaki and that official's congratulations on the safe arrival of the *Preble*. After answering the visitor's questions respecting the objects of the voyage of the *Preble*, her dimensions, the age of her commander, and the size of the American navy, Glynn presented him with a letter for the governor requesting the release of the prisoners. On the 22d Matsmora Schal returned to say that the governor had received the letter. Glynn asked him when an answer was to be expected and whether the men were to be given up, but was unable to obtain a satisfactory reply. On the same day, the 22d, a message was received

[34] For the principal documents relating to the voyage of the *Preble*, see Sen. Doc., No. 59, 32 Cong., 1 sess., pp. 2-63.

from Levyssohn stating that the governor had requested him to translate Glynn's letter; that he had intimated to the governor the necessity of releasing the men; and that, impressed with the fact that the governor could not legally act on their case without a special order from the Emperor at Yedo, he had proposed that the men be delivered to him at the factory to be conveyed thence to the *Preble*.

On the 23d Serai Tatsnosen returned to the ship, and an interview took place in which Glynn spoke with unusual candor and brusqueness. His speech had also a note of Occidental conceit and superiority, such as has often marked the intercourse of the Western peoples with those of the East. It was evidently intended to operate upon the fears of the Japanese. Glynn thus describes the dialogue between himself and his visitor:

Chief to Commander Glynn.—I am happy to see you, sir. The shipwrecked Americans, as I stated to you in my conference of the 18th, are in Nangasacki. I have come to-day to say that Mr. Levyssohn called upon the governor of Nangasacki in relation to the demand contained in your letter to the governor for the release of your countrymen. Mr. Levyssohn begged the governor to set aside the usages of Japan, which must (if the governor insisted upon them) keep the Americans here until a period of thirty-five or forty days should elapse, and to give the men to the officer who had been sent for them; that he (Mr. L.) would take the men and deliver them to the commander of the *Preble*, etc., etc. I have come to tell you that day after to-morrow Mr. L. will call and see you on board your ship.

Answer.—Sir, I am obliged to you for your politeness, and hope you are well. I have heard what you have said. I am displeased at it. I cannot stay here from day to day under such pretences. I have other duties to perform, and it is necessary my business should be despatched quickly. You say that Mr. Levyssohn has "begged the governor," etc., etc. I, too, beg that my shipwrecked countrymen should be restored to their homes. But understand me, I came here to treat with your governor, not with Mr. Levyssohn, or any other individual. I am under positive orders to demand from the governor of Nangasacki the release of the Americans in his hands. I want to know decisively if I am to get the men. I want the chief to reply to my question.

Chief.—This cannot be. Why not stay a few days? You will get the men, I think.

Question by Commander Glynn.—Do you say that I can get the men day after to-morrow?

Answer.—No; not day after to-morrow. The day after to-morrow Mr. Levyssohn will come and see you on this business, and afterwards, I cannot say how long, I think you will get your sailors. Mr. Levyssohn will send you a letter to-day.

Question.—Well, your answer is very far from satisfying me. It is necessary for me to see Mr. Levyssohn. Then I will go now, and call on him at Decima.

Answer.—You cannot, for he is sick.

Question (to the interpreter).—Is it necessary for the governor to get permission from the Emperor before giving up the men?

Answer.—Yes.

Commander Glynn to the interpreter.—"Yes." Well, that is enough for me to hear.

Interpreter.—But stop; pray hear me. What do you do so for (alluding to the gestures of Commander Glynn)? It is not good, it is not Japanese custom.

Commander Glynn.—Well, it is my custom. It is the custom of my country, under such circumstances; and if it is necessary to send to the Emperor before giving me these shipwrecked men, I cannot stay here. My government knows very well how to recover its citizens. You need not point to your chief. I am as great as he is. You must look me in the face when speaking to me. So far as I am concerned, this matter is settled. You need say no more. I do not know any one in this business except the governor. I know no other person; nor do my orders require that I should speak to any one but the governor. If you will promise that on the day after to-morrow the men will be given up, then I will stay. If this promise cannot be given, then I have no farther business here; my errand is at an end. I will get under way to-day—yes, in five minutes—and report to my government that you decline complying with my demand for the release of the men.

Answer (with much trepidation).—Mr. Levyssohn will call on you in two days. I will do all I can, and exert my influence with the governor to give you the men soon. "I think" you may expect it and—

Commander Glynn.—Stop! Your policy is very apparent. Now, I do not want to know what you "think"; you have had ample time, certainly, to think. I can think also. I have thought a great deal. It is time that matters should come to a crisis—that something definite was arrived at. I have been here five days—a time full enough for the governor to have come to some determination, and to have sent me a reply to my letter. You put me off from day to day on the merest pretences, and up to this moment you refuse to let me know if my demands are to be denied, or not. I want a "positive promise" as to whether I am to get the men or not. Under such a promise I will give two days; more I must not, cannot give. Will you give me this promise?

Answer.—I cannot promise. I think after you have seen Mr. Levyssohn, you will get the men soon.

Commander Glynn.—I understand very well the meaning of this delay, nearly as well as you do. I think I will go to the governor myself, and there can be no better time than to-day. Can I see him?

Answer.—No; you cannot go to the governor. I will tell the governor and do all I can to have your business finished. In two days you cannot get the men—in three days, I think. Day after to-morrow Mr. Levyssohn will speak to you. He has talked with the governor about it.

Commander Glynn. It is useless to talk to me in this mann
no prevarication. I want a straight up and down answer. I h
waited five days—four days too long; and now I want to know
more than "I think." You give a direct reply to my question,
do the thinking. I will stay three days—certainly no longer—bu
promise me now that in three days you will deliver up the mer
promise?

Answer.—Yes; in three days you shall get possession of th
mean the day after the second day from now.

Commander Glynn.—Very good (offering his hand to the c
took it). I rely upon your word—upon the solemn promise of a
chief. I place full confidence in your honor. I believe that you
your promise.

During the whole of this conference, there was a constant refe
the interpreter to the principal chief, "Tatsnosen," and his as
The conference ended, the chief walked around the ship, inspected t
at general quarters, etc.[18]

From the speeches of the Japanese official, it is evident th
governor had accepted the suggestion of Levyssohn. On the
the Dutch superintendent, being still sick, sent his represent
to the ship to present Glynn with an official account of the
finement of the prisoners. This was much more favorable to
Japanese than the account given by the prisoners, who claime
have been harshly treated. On the following day a high milit
chief, Hagewara Matasak, appeared on board the *Preble*, chie
for the purpose of making this brief speech to Glynn: "To-d
you will get your countrymen. After they come on board yo
ship, it is the verbal order of the governor for you to go away."
Levyssohn's representative and another Dutchman from Deshi
next arrived, and they presented Glynn with some papers from
the Japanese government. Shortly after they left, a boat flying
the Dutch flag came alongside the *Preble* and delivered fourteen
sailors—thirteen of them from the *Lagoda*, and one, Ranald Mc-
Donald, from the American whaler *Plymouth*, of Sag Harbor.
Desirous of obtaining a knowledge of the Japanese, McDonald
had, at his own request, been set adrift in a boat on the coast of
Japan, and, after an experience similar to that of the deserters of
the *Lagoda*, was taken to Nagasaki.

On the morning of the 27th the *Preble* sailed for Shanghai,
where she arrived six days later. Notwithstanding the signal
success of Glynn's mission, he seems to have received no marks of
official favor or appreciation. Some credit for its success doubt-

[18] Sen. Doc., No. 59, 32 Cong., 1 sess., pp. 35-36.

ess belongs to Levyssohn, who well merited the thanks tendered him by Glynn. The visit of the *Preble* to Japan marked a distinct advance in our intercourse with that country. While the *Manhattan* had returned some Japanese to their native land, the *Preble* had performed the much more difficult task of obtaining the release of Americans confined in Japan.

XII.

THE OPENING OF JAPAN: 1851-1854.[16]

The philosophical historian, powerless to predict with accuracy before the event, but wonderfully wise with explanations after it, is likely to discover numerous "causes" of the opening of Japan. He finds the times ripe for loosening the fetters that bound that country to an obsolete policy, and the circumstances unmistakably pointing toward America as the country destined to achieve the great work. Thus, a young Japanese author, schooled in the historical method of an Occidental university, enumerates the following as causes leading to the inception of the American expedition: on the one hand, the safety of American whalers on the coast of Japan, the rise of industrial and commercial commonwealths on the Pacific, the discovery of gold in California, the increasing trade with China, the development of steam navigation necessitating coaling depots and ports for shelter, the opening of highways across the Isthmus of Central America, the missionary enterprises on the Asiatic continent, and the rise of the Hawaiian Islands; and on the other hand, the knowledge of foreign nations among the ruling classes of Japan, the news of the British victory in China, the progress of European settlements in the Pacific, the dissemination of Western science among a progressive class of Japanese scholars, and the advice of the Dutch government to discontinue the antiquated policy of exclusion.[17] These

[16] This chapter is based chiefly on the East India Squadron Letters, 1851-1855; Sen. Ex. Doc., No. 59, 32 Cong., 1 sess., pp. 57-62, 73-82; No. 34, 33 Cong., 2 sess.; American Historical Record, III, 148-149, 294-296; Hawks, F. L., Narrative of the Expedition of an American Squadron to the China Seas and Japan, Vol. I; Spalding, J. W., Japan and Around the World, 101-344; Taylor, Bayard, A Visit to India, China, and Japan, 360-4[illegible]; Nitobe, I. O., The Intercourse between the United States and Japan, [illegible]-54; and Griffis, W. E., Matthew Calbraith Perry, 281-374.

[17] Nitobe, I. O., The Intercourse between the United States and Japan, [illegible]-33.

are undoubtedly pertinent facts, and from them it may be seen that the opening of Japan by the United States, like every other historical happening, bears a definite relation to certain antecedent conditions; but they by no means prove that the event flowed irresistibly out of those conditions. Had Great Britain, and not the United States opened Japan, the philosophical historian would have discovered in that fact no reason for astonishment, but on the other hand he would possibly have explained it as the inevitable effect of numerous causes, such as the gradual extension of British influence in the Far East, the predominance of Great Britain in Oriental commerce, her opening of China in 1842, her several attempts to open Japan, her surveys of Japanese waters, and the need of her shipwrecked seamen cast away in Japan for protection.

To a writer who is somewhat skeptical of the probative value of historical causes, it will not be necessary to go far afield in explaining the decision of the American government in 1851 to make another attempt to establish commercial relations with Japan. On January 6 of that year Mr. Aaron H. Palmer, of Washington, wrote a letter to President Fillmore, in which he recommended the sending of a mission to Japan, entrusted to a special commissioner and supported by an imposing squadron. Fillmore referred this letter to his Secretary of State, Daniel Webster, with whom Palmer several times conferred respecting his proposal. In January, 1851, the *Preble* arrived at New York, and Commander Glynn shortly went to Washington, where he doubtless laid before the government the details of his cruise and urged upon it the need of the United States for a coaling depot in Japan, a project he strongly favored. In June, under order from the President, Glynn prepared a statement of his views respecting the opening of Japan.

Early in May Commodore J. H. Aulick, who had been selected to succeed Commodore P. F. Voorhees, as commander-in-chief of the East India squadron, and who was then preparing his flagship, the *Susquehanna*, for a voyage to China, proposed to Secretary Webster that the returning to their native land of several Japanese sailors who had been picked up at sea and had been brought to San Francisco might afford a favorable opportunity for establishing commercial relations with Japan. Webster was favorably impressed with Aulick's proposal, and he at once

brought it to the attention of President Fillmore, who, after discussing it with his cabinet, decided to establish a mission to Japan, to entrust it to Aulick as an envoy of the United States, and to empower him to negotiate a treaty with the Japanese government. In a letter from Fillmore to the Emperor, dated May 10, 1851, the objects of the proposed negotiations were stated to be the establishment of friendly commercial intercourse and the obtaining of a coaling depot. A letter of credence from Fillmore to Aulick was dated May 30, and Aulick's instructions from Webster bore the date of June 10. These latter he probably did not receive until he reached his station, since he sailed from Old Port Comfort on June 8.[12]

As Aulick had suggested the mission, and as he had previously visited the Far East, his appointment to negotiate a treaty with Japan was a most fitting one. His squadron was composed of three vessels, the flagship *Susquehanna*, Captain William Inman, and the sloops of war *Plymouth*, Commander John Kelly, and *Saratoga*, Commander W. S. Walker. The *Susquehanna* was a steam frigate, bark-rigged, and was the first American steam vessel of war to visit the Orient. Secretary of the Navy Graham regarded this small fleet as quite sufficient for the performance of the duties entrusted to Aulick. To the secretary, the expedition to Japan was merely incidental to the regular work of the squadron, and no special preparations for it were made. On the outward voyage Aulick conveyed several distinguished passengers to Rio Janeiro, namely, the Chevalier S. de Macedo, minister of Brazil to the United States; Mr. Robert C. Schenck, United States minister to Brazil, and Mr. J. S. Pendleton, charge d'affaires to the Argentine Republic.

Unfortunately for the commodore, and mainly as a result of his irascibility, some unpleasant incidents occurred on the voyage to Rio Janeiro and after reaching that city. He and his captain quarreled over their respective duties on shipboard, and so serious were their differences that each wrote to the Secretary of the Navy making charges against the other. Aulick asked the secretary either to detach Inman or to allow him a commander, adding that

[12] Palmer, A. H., Documents and Facts Illustrating the Origin of the Mission to Japan, 5, 22; Davis, G. L., Origin of the Japan Expedition, 7; American Historical Record, III, 148-149, 294-297; Sen. Ex. Doc. No. 59, 32 Cong., 1 sess., 57, 74, 80-82; Executive Letters, U. S. Navy Department Archives, January-May, 1851, 123.

if neither of these requests could be granted, he wished to be relieved from his command at the earliest day consistent with the good of the service. Greatly incensed at the quarrelling officers, the secretary sharply reproved both of them, using these words in a letter to Inman:

Were it not that the public interests might suffer by the recall of the *Susquehanna*, the Department would not hesitate to order her return for the purpose of relieving the two senior officers as wholly disqualified, under the temper which they have evinced, to carry out any important instructions of their government."

During the voyage to Rio Janeiro, Minister Schenck discovered, or thought he discovered, certain facts gravely reflecting upon the conduct of Aulick, and he therefore wrote to the State Department making a "painful and mortifying" disclosure respecting that officer. He charged him with allowing Minister Macedo to make the passage to Rio Janeiro under the impression that he was being entertained at the expense of the commander-in-chief, when as a matter of fact the United States government was paying for his entertainment. The whole affair was trivial, and should never have been made the subject of a communication to the State Department. Schenck's charges reached Secretary Webster about the middle of November, 1851, and he at once forwarded them to Secretary Graham, who on the 17th of that month wrote to Aulick asking for an explanation. On the following day, as the President had in the meantime decided to remove Aulick from his command "in order to satisfy Brazil," Graham wrote again, directing him to remain at Hong Kong or Macao until his successor as commander of the squadron should arrive there.

These letters reached Aulick a few days after his arrival in China, and, astonished and mortified beyond measure, he at once replied to Schenck's charges, denying them absolutely and supporting his denials by the testimony of his officers. Ill at ease, and often incapacitated for duty by sickness, he remained on his station more than a year, awaiting the arrival of his successor. Finally, in March, 1853, he left China for America, taking the overland route and stopping at London. On reaching Washington he requested the Secretary of the Navy to institute an official investigation of his conduct, if he were dissatisfied with the explanations already made to the Department. The secretary assured him that the explanations were "full, complete and satisfactory," and that the ordering of a naval court was not deemed

necessary. It later appeared, however, that Schenck's charges were partly true, for Macedo had been under the impression that Aulick was paying for his mess aboard ship, a misapprehension that arose from no intentional deception on the part of his host.

Aulick's tour of duty in the Far East was his last sea service. In 1867 he was promoted to be commodore on the retired list, and three years later he died in Washington. To the end of his life his recall was a sore point, and he never forgave the Navy Department for snatching from him the honor of opening Japan, which he conceived to be practically within his grasp.[39]

On the same day that Secretary Graham wrote to Aulick to await in China the arrival of his successor, he addressed a letter to Commodore Matthew C. Perry, who was stationed at New York, ordering him to proceed at once to Washington to confer with the Department. When Perry arrived at the capital, Graham and Secretary Webster were too busy to discuss with him his selection as Aulick's successor, the purpose of his visit. Graham therefore directed him to return to his station and await the instructions of the Department. Shortly after his return, he wrote a letter to Graham expressing his views respecting the proposed assignment of duty. He said that he much preferred to be commander-in-chief of the Mediterranean squadron, since in time of peace that office was the most desirable in the gift of the Secretary of the Navy, and the one conferring the most honor. He was willing, however, to accept the office offered to him provided the sphere of action of the East India squadron and its force were so enlarged "as to hold out a well-grounded hope of its conferring distinction upon its commander." He was of the opinion that the object of the government respecting Japan could not be attained without greatly augmenting the fleet in the Eastern seas.

On January 14, 1852, Graham again ordered Perry to report at the Department in Washington. It was probably before that date that President Fillmore considered the subject of the Japan mission with his cabinet; and (quoting his own words used in 1874) "it was finally determined to send an expedition expressly to Japan and Commodore Perry was selected to take the command. Instead of sending a single ship, it was thought best to send a

[39] Executive Letters, June-December, 1851, 74; Confidential Letters, II, 267-268; East India Squadron Letters, 1851-1853, 155-170; National Intelligencer (Washington), Dec. 19, 1853; Jan. 3, Jan. 9, 1854.

somewhat formidable and imposing fleet, as the show of power might be deemed a persuader with that people in procuring a treaty." [20]

Commodore Perry belonged to a family already distinguished for its naval achievements before he shed lustre upon it. His father, Captain C. R. Perry, had served in both the Revolutionary navy and the early navy under the Constitution, and his brother, Commodore O. H. Perry, had won the victory at the battle of Lake Erie, which he announced in those well-known words: "We have met the enemy and they are ours." In the War of 1812 Matthew C. Perry had served as a subordinate officer on board the frigate *President*, and after that conflict he had had a varied career at sea and on shore, assisting in the suppression of piracy, in founding a colony in Africa, in establishing a steam navy and a naval apprentice system, and in improving the naval ordnance. In 1843, as commander of the African squadron, he pursued, with remarkable success, a "powder and ball" policy in dealing with the natives of the west coast of that continent, and during the Mexican War he commanded one of the largest squadrons ever assembled under the American flag. At the time of the expedition to Japan he was fifty-nine years old, having spent forty-three years in the navy.

On March 24, 1852, Secretary Graham formally directed Perry to take command of the East India squadron, then consisting of the *Susquehanna*, *Plymouth* and *Saratoga*, in China. To these ships were added the steam frigate *Mississippi*, the first-class steamer *Princeton*, and the storeship *Supply*. The *Mississippi*, Perry's flagship in the Mexican War, was designated as the flagship of the squadron until the commodore should reach his station. She was one of the pioneer steam vessels of the navy, having been built in 1841. She was burnt and sunk on the river that bears her name in 1863.

During most of the year 1852 Perry was busy preparing for his expedition. The procuring of charts and books relating to Japan early engaged his attention, and in the spring he visited Albany, Boston and New Bedford in the interest of his mission. The governor and officials of New York gave him several valuable publications of that State, and the textile manufacturers of Massa-

[20] American Historical Record, III, 149; Letters to Officers of Ships of War, XLVI, 226, 332; Captains' Letters, July-December, 1851, 136.

chusetts supplied him with specimens of cloth. From numerous sources he obtained curios, arms and various articles illustrative of the progress of the mechanical arts. At New Bedford the owners and masters of whaling ships gave him information respecting the cruising grounds and the usual ports of resort of their vessels. Two artists and an agriculturist were engaged, and rated as officers of the navy, as Perry was resolved to admit no one on board his ships who was not subject to naval discipline. He was exceedingly careful to select able and discrete officers. Commander H. A. Adams was made captain of the fleet, and Commanders Franklin Buchanan and Sidney Smith Lee received important offices. Lieutenants John Contee and Silas Bent were attached to the *Mississippi* as flag lieutenants, the last-named having served with Glynn on the *Preble*.

The *Supply* was the first ship to sail, leaving New York in May (1852). The *Princeton* and *Mississippi* were not ready until fall, by which time the Department had decided to add to the squadron the ship of the line *Vermont*, the corvette *Macedonia*, the steamer *Alleghany*, the sloop of war *Vandalia*, and the storeship *Southampton*. On November 8 President Fillmore and Secretary of the Navy Kennedy visited the *Mississippi*, then at Annapolis, to bid the commodore good bye. A few days later she proceeded to Norfolk where she was joined by the *Princeton*. The latter vessel on her passage from Baltimore down the Chesapeake proved to be so defective that Perry decided to go to sea without her, and accordingly on November 24 he sailed from Norfolk for China, with a single ship of his squadron, the *Mississippi*.

Before his departure, Perry received from the government at Washington the various official documents relating to his mission: a letter of credence signed by President Fillmore; a letter addressed to the Emperor of Japan signed by Fillmore, countersigned by Secretary of State Edward Everett, and drafted by Secretary of State Daniel Webster, who had recently died; sailing orders from the Navy Department; and instructions from the State Department, bearing the signature of Acting Secretary of State C. M. Conrad. The last-named document expressed best the expectations of the government. The objects of the expedition were stated to be, first, the protection of American seamen and property in Japan and Japanese waters; second, the opening of one of or more ports to American vessels for the obtaining of

supplies, and third, the opening of one or more ports for purposes of trade. Perry was directed to try first the efficacy of argument and persuasion. If he failed by the use of these means, he was to change his tone and inform the Japanese in the most unequivocal terms that the American government would insist that all its citizens who temporarily sought refuge in Japan on account of shipwreck or stress of weather should be treated with humanity, and that it would chastise severely any one who should practise upon them acts of cruelty. He was to bear in mind, however, that the President had no power to declare war, that the mission to Japan was necessarily of a pacific character, and that force was not to be used except in self-defense. The coasts of Japan and the adjacent islands were to be surveyed, provided it could be done without interfering with the main object of the mission.[21]

The American government made no secret of the expedition to Japan, which, before Perry left the United States, had assumed the importance of an international event, arousing the interest of the whole civilized world. The public prints both at home and abroad commented freely upon it, generally wishing it good fortune, but gravely expressing their forebodings of failure. The *London Times* doubted "whether the Emperor of Japan would receive Commodore Perry with most indignation or most contempt." Rumors were circulated that the expedition was not a wholly pacific one. Joking on this aspect of it, *Punch* declared that Perry must open the Japanese ports even if he had to open his own. A Washington correspondent of the Baltimore *Sun*, comparing the sailing of Perry's fleet to the sailing of "Rufus Porter's aerial ship," insisted on the "abandoning of this humbug, for it has become a matter of ridicule abroad and at home."[22]

Before leaving the United States, Perry had pretty thoroughly familiarized himself with the literature relating to Japan, and during his voyage he continued his studies and also matured a plan of operations. From Madeira he wrote to the Secretary of the Navy recommending as a preliminary step in the negotiations the securing of one or more ports of resort in Japan or in the Lu-chu Islands. The President authorized him to carry out his recommendation, at the same time cautioning him to "make no

[21] Sen. Ex. Doc., No. 34, 33 Cong., 2 sess., pp. 7-8.

[22] Nitobe, I. O., The Intercourse between the United States and Japan, 43-44.

use of force, except in the last resort for defence." The President also approved another suggestion of Perry, the encouraging of the natives in the neighborhood of the ports of resort to turn their attention to agriculture in order that they might provide themselves with the means of supplying vessels [illegible]

On the outward voyage the *Mississippi* touched [illegible] the Cape of Good Hope, Mauritius and Singapore [illegible] and finally arrived at Hong Kong on April 7, 1853, [illegible] after Aulick relinquished his command. Perry found on station the *Susquehanna, Plymouth, Saratoga* and *Supply*. After visiting Canton and engaging the American missionary, Dr. S. W. Williams, as interpreter, he proceeded to Shanghai, where he assembled all his vessels, except the *Saratoga*, which he left at Macao under orders to await the arrival of Dr. Williams and join the fleet at the Lu-chu Islands. In the latter part of May all the vessels of the squadron, with the exception of the *Saratoga* which was left at Shanghai to guard American interests, arrived at Napa, Great Lu-chu Island. As the commodore had decided to make Napa a port of refuge, he spent several days there cultivating the friendship of the natives. On June 6, accompanied by a suite of officers, he visited the prince-regent at his palace and was hospitably received. During the stay of the fleet at Napa an exploring party, in charge of the Reverend George Jones, the chaplain of the *Mississippi*, penetrated the island in search of scientific information, and the harbors of Napa and Melville were surveyed.

While awaiting the arrival of a collier from Shanghai, Perry with the *Susquehanna* (now the flagship) and *Mississippi* visited Port Lloyd, Peel Island, situated some eight hundred miles eastward of Nagasaki. Here he purchased a tract of land for a coaling depot, surveyed the harbor, explored the island, and distributed some live stock and garden seeds among the settlers. After a brief stay he returned to Napa.

Finally the preparations were completed; and on the morning of July 2 the squadron, consisting of the steamers *Susquehanna* and *Mississippi* and the sloops of war *Saratoga* and *Plymouth*, set sail for the bay of Yedo, one thousand miles east-northeast of Napa. Perry had fully considered the policy that was to govern his dealings with the Japanese, and had fixed definitely its general lines. He decided not to resort to force, unless it was

absolutely necessary. Those courtesies which were due from one civilized nation to another he should demand as a right and not solicit as a favor. He should [illegible] petty annoyances, disregard all threats, and confer only with functionaries of the highest rank. By keeping himself in the background, surrounding his person with an air of mystery, and insisting upon elaborate formalities, he should strive to impress the Japanese with the importance of his mission and to win their respect.

On the morning of July 8, as the ships approached Yedo Bay, their decks were cleared for action, the guns were placed in position and shotted, and the crews were called to quarters. About five o'clock in the afternoon the fleet anchored off the town of Uraga on the west side of the bay, twenty-seven miles from the capital. It was immediately surrounded by Japanese boats, one of the most conspicuous of which came alongside the flagship, and a Japanese officer asked for the commander-in-chief. On learning that the rank of the officer was only that of a vice-governor, Perry refused to see him, but appointed Lieutenant Contee to confer with him. For this interview and the events of the following day, Perry's narrative is the best authority:

He was merely told, under instructions from me, that I had been sent on a friendly mission to Japan, with a letter from the President of the United States for the Emperor, and it was my desire to have a personal interview with a dignitary of the highest rank, in order to make arrangements for the delivery of copies and translations of the documents with which I had been charged, preparatory to the formal presentation of the originals.

He replied that Nagasaki was the only place, according to the laws of Japan, for negotiating foreign business, and it would be necessary for the squadron to go there; to which he was told that I had come purposely to Uraga, it being near to Yedo, and should not go to Nagasaki; that I expected the letter to be duly and properly received where I then was; that my intentions were perfectly friendly, but I would allow of no indignity, nor would I permit the guard-boats, which were collecting about the ships, to remain where they were, and if they were not immediately removed, I would disperse them by force. On having this interpreted to him, he suddenly left his seat, went to the gangway and gave an order which caused most of the boats to return to the shore; but a few of them remaining in clusters, an armed boat from the ship was sent to motion them away, at the same time showing their arms, which had the desired effect, all of them disappearing; and we saw nothing more of them near the ships during the remainder of our stay. Here was the first important point gained.

The vice governor shortly after took his leave, saying that he had no authority to promise anything respecting the reception of the President's

letter, but in the morning an officer of higher rank would come from the city, who might probably furnish some further information.

On the following morning, the 9th, the governor of Uraga, Kayama Yezaimon, came on board, thus giving the lie to the vice governor, who declared himself of the highest authority in the city; and as this officer was of superior rank to the visitor of the day before, I directed that he should be received by Commanders Buchanan and Adams and Lieutenant Contee, still refusing to receive myself any one but a counsellor of the empire (cabinet minister).

The governor, after a long discussion in which he more than once declared that the Japanese laws made it impossible that the letter should be received at Uraga, that the squadron must go to Nagasaki, and even if the letter of the President were to be received at this place, a reply would be sent to Nagasaki. In answer to this he was told I would never consent to such arrangement, and would persist in delivering it where I then was; that if the Japanese government did not appoint a suitable person to receive the documents addressed to the emperor, I would go on shore with a sufficient force and deliver them, whatever the consequence might be.

On this being communicated to him, he said he would return to the city and send a communication to Yedo asking for further instructions; that it would require four days to obtain a reply; upon which he was told that I would wait until Tuesday, the 12th, three days, when I should certainly expect a definite answer. Accordingly he left the ship with the understanding that there would be no necessity for any further discussion until the time appointed for the delivery of the answer from Yedo should arrive.

At this interview the original letter of the President, together with my letter of credence, were shown to the governor, encased as they were in the magnificent boxes which had been prepared at Washington, the exquisite workmanship and costliness of which evidently surprised his excellency, and, on leaving the ship, he made an offer for the first time of supplies of water and refreshments, but was told that we did not stand in need of anything.

I had directed that a surveying boat, well manned and armed, from each ship of the squadron, should commence at daylight this morning, the 9th, the survey of the harbor and bay of Uraga, and thinking it quite possible, they might meet with some resistance, I instructed Lieutenant Silas Bent, in command of the surveying party, not to go beyond the range of our guns, and caused a lookout to be kept upon them, that assistance might be sent should they be attacked; but though they were followed by numbers of Japanese boats, they did not, on seeing our men well armed, venture to molest them.

The governor inquired what these boats were doing, and, on being told they were surveying the harbor, he said it was against the Japanese laws to allow of such examinations; and he was told that, though the Japanese laws forbade such surveys, the American laws command them, and that

we were as much bound to obey the American as he was the Japanese laws. Here was a second and a most important point gained.[28]

The following day, July 10, being Sunday, no communication was had with the officials. Early in the morning of the 11th, Perry ordered the surveying boats, under convoy of the *Mississippi*, to proceed farther up the bay toward Yedo, hoping thus to alarm the Japanese and induce them to give a satisfactory answer to his demands. Presently the governor came on board the *Susquehanna*, and asked why the vessels were sent up the bay. He was informed that, as the anchorage at Uraga was unsafe and inconvenient, a more favorable one was being sought nearer to Yedo, which the squadron would use the coming season, should it be necessary to return to Japan at that time.

On the morning of July 12, the day on which an answer from the Emperor was expected, the governor came on board the flagship, accompanied with two interpreters. He said that a misunderstanding had arisen respecting the proposed plan of the Americans to deliver first the translations and later the originals of the official documents. After much discussion, Perry consented to deliver both at the same time, provided a dignitary of the highest rank was appointed to receive them. The governor agreed to this, and said that an appropriate building for use as a council-house would be erected. He further stated that the Emperor's answer would be sent to Nagasaki to be delivered to the Americans by either the Dutch or Chinese superintendent there. Perry replied that he would not go to Nagasaki, that he would receive no communication through the Dutch or Chinese, and that he expected a reply of some sort to be delivered to him in Yedo Bay.

The place selected for a meeting was the village of Kurihama near Uraga. At first Perry opposed this selection, saying to the Japanese that one of the houses or forts opposite the anchorage of his ships would be acceptable to him. Later, however, when informed by his surveying party that the fleet could be brought within gunshot of Kurihama and that large numbers of the natives were to be seen completing the building and transporting to it furniture and other articles, he made no further objections. On the 13th the governor presented the credentials of his highness, Toda, prince of Idzu, the representative of the Emperor

[28] Sen. Ex. Doc., No. 34, 33 Cong., 2 sess., pp 46-47.

and they proved to be satisfactory. On the following morning the whole fleet was anchored in line so as to cover with its guns Kurihama and the adjacent shore. Under date of July 14 Perry has this entry in his notes:

This being the day appointed for my reception on shore, and every preparation having been made for landing a formidable escort composed of officers, seamen, and marines, from the respective ships, about 400 in number, all well armed and equipped; and being ready for disembarcation, the two steamers moved to a position commanding the proposed landing-place (the sloops of war not being able to move for want of wind), and shortly after the detachment forming, the escort were in the boats and on their way to the shore, where they landed and formed, and were immediately followed by me.

The whole shore of the bay, extending more than a mile, was crowded with Japanese troops—from five to seven thousand—drawn up under arms. These troops were composed of cavalry, artillery, infantry and archers; some of the infantry with flint muskets, others with matchlocks.

On landing, I proceeded at once to the building erected for the purpose, and was there received by the prince of Idzu, first counsellor of the emperor, and his coadjutor, the prince of Iwami. To the former of these I presented the President's letter, my letter of credence, and three communications from myself, together with transcripts of the same in the English, Dutch, and Chinese languages, for which the prince of Idzu gave me a receipt.

The princes were attended by the governor of Uraga, the chief interpreter, and a secretary.

As it was understood that there was to be no discussion at this meeting, I remained but a short time, taking my departure and embarking with the same ceremony with which I had landed.[24]

To the commodore's concise account a few facts illustrative of the brilliant pageantry of the meeting may be added. At the head of the American party was a company of marines commanded by Major Zeilen; following them was a stalwart boatswain's mate, bearing the broad pennant, which was supported by two tall athletic seamen; then came two boys especially dressed for the occasion carrying in a envelope of scarlet the box containing the official documents; and next came the commodore with two black body guards, his staff, a suite of officers, two standard bearers, a company of sailors gaily uniformed, and the band of the *Mississippi*. The official documents were of folio size, beautifully written on vellum, and bound in blue silk velvet. Each seal was attached by cords of interwoven gold and silk with pendant gold tassels, and was encased in a box of rosewood, with lock, hinges

[24] Sen. Ex. Doc., No. 34, 33 Cong., 2 sess., pp. 50-51.

and mountings of gold. As a receptacle for the documents the Japanese had prepared a large lacquered box of a scarlet color, and supported by feet of brass or gilt.

The meeting place was a room in a thatched building, entirely open on one side and draped with gauze curtains. One the left of the room as you entered it were seated the princes of Idzu and Iwami, and behind them a considerable number of two-sworded mandarins. The prince of Idzu was garbed in a maroon silk robe, an over-garment of red, and blue cloth socks. His suite were attired in much the same manner. On the right side of the room were some ornamental chairs, placed there for the use of the Americans.

The conference opened with a few minutes of complete silence, both parties being seated. Tatznoske, the pricipal interpreter for the Japanese, was the first to speak, asking Mr. A. L. C. Portman, the Dutch interpreter of the Americans, if the documents were ready for delivery, and informing him that the prince of Idzu was ready to receive them. On this being interpreted to the commodore, he beckoned to the two boys, who came forward bearing the handsome boxes, and followed by two stalwart negroes. On reaching the receptacle prepared by the Japanese, the boys handed the boxes to the negroes, who opened them, took out the documents, and after displaying the writing and the seals laid them upon the lid of the receptacle. Under instructions from the commodore, Mr. Portman indicated to Tatznoske, who with the governor of Uraga was kneeling, the character of the several documents. Tatznoske then arose, and approaching the prince of Iwami prostrated himself and received from the prince a roll of papers, then crossing the room he fell on his knees before the commodore and presented him with it. After an interval of silence the commodore directed his interpreter to inform the Japanese that he would leave within a few days with the squadron for the Lu-chu Islands and Canton, to offer them his services if they wished to send dispatches, and to say that it was his intention to return again in the spring. When the Americans arose to depart, the two princes also arose and remained erect while their visitors filed out of the building, still preserving an absolute silence.

The roll of papers presented to the commodore by Tatznoske was an Imperial receipt for the President's letter, which, the

receipt stated, was received at Uraga, in opposition to Japanese law, because a refusal would have insulted the ambassador of the President. The receipt closed with these words. "The letter being received, you will leave here." To show the Japanese how little he regarded their command, Perry, on returning to the flagship, proceeded toward Yedo with the whole fleet, a part of it resuming the work of surveying the bay. On July 15 and 16 the surveys were continued, and the boats of the *Mississippi* made soundings within six miles of the capital. The nearer the Americans approached Yedo, the more polite and friendly the Japanese became. On the 16th the governor brought numerous presents to the flagship, which Perry consented to accept on the condition that he be permitted to return the courtesy. The governor raised the invariable objection that the Japanese law forbade the acceptance of favors from foreigners, but he finally yielded, returning to the shore with gifts exceeding in value that of those he brought. "Here," wrote Perry, "was another point gained in the unprecedented circumstances of their consenting to exchange presents."

Perry's decision not to wait for a reply to the President's letter, but to return to China and come again in the spring was not only stated verbally to the princes, but was also committed to writing and sent to the Emperor. In reaching this decision he was moved by several considerations. It seemed best to him to give the Japanese government ample time for reflection and discussion, and not to press it for an immediate answer when it could offer valid excuses for refusing one. Moreover, his fleet was in need of coal and refreshments, the situation in China called for the presence there of several vessels, and by the following spring re-inforcements from America would have arrived on the station.

On July 17, having been nine days in Yedo Bay, the fleet weighed anchor and went to sea. The *Saratoga* proceeded to Shanghai for the protection of American interests there, and the other vessels to Napa, where Perry arrived on the 25th. After renting a coaling depot of the islanders, he sailed for Hong Kong with the *Mississippi* and *Susquehanna*, leaving the *Plymouth*, Commander John Kelly, at Napa, under orders to visit the Coffin Islands and take possession of them in behalf of the United States. Kelly made the outward voyage to the islands in October, and on the 30th of that month took possession of them, at Newport,

Hillsborough Island, by hoisting the United States flag, firing a salute of seventeen guns, and burying a copper plate and a bottle.[a]

In the fall of 1853, the East India squadron was mainly occupied with the protection of American interests in China, which country was then suffering from a civil war. Several vessels had lately arrived from America, the steamship *Powhatan*, sloop of war *Vandalia*, corvette *Macedonian*, and storeships *Southampton* and *Lexington*. Two other vessels, the *Vermont* and *Alleghany*, which had been promised Perry, were detached from his command by the new government at Washington that came in with President Pierce. Perry directed the work of the squadron from Macao, where he established himself on shore, together with the artists and surveying officers of the expedition, who were employed in arranging and collating the scientific information that had been collected.

In November the French frigate *Constantine* suddenly left Macao under sealed orders; and about the same time a Russian squadron arrived at Shanghai, having lately visited Nagasaki where its commander had attempted to open negotiations with the Emperor. These movements aroused Perry's suspicions, and fearing that the French and Russians might interfere with his plans, he decided to act promptly by returning at once to Japan. In January, he assembled at Napa all the vessels of his fleet that could be spared from China. On February 1 the sailing ships *Macedonian*, Captain Joel Abbot, *Vandalia*, Commander John Pope, *Southampton*, Lieutenant J. J. Boyle, and *Lexington*, Lieutenant J. J. Glasson, sailed for Yedo Bay, and six days later they were followed by the steamers *Susquehanna*, Commander Franklin Buchanan, *Mississippi*, Commander S. S. Lee, and *Powhatan*, Commander W. J. McCluney. On the 11th the *Southampton* arrived at the "American anchorage," ten miles above Uraga; and two days later she was joined by the remaining vessels of the fleet.

Soon after Perry left Yedo Bay in July, 1853, copies of President Fillmore's letter to the Emperor were sent to many of the principal rulers and dignitaries of Japan, requesting them to express unreservedly their opinion of it; and more than forty of them did so. They were almost unanimous in opposition to the opening of their country permanently to foreign commerce. Several, however, were willing to try the experiment for a limited

[a] Log of the *Plymouth*, U. S. Navy Department Archives, Oct. 30, 1853.

period. Declaring that "the policy of the barbarians is first to enter a country for trade, then to introduce their religion, and afterward to stir up strife and contention," the prince of Mito memorialized his government in favor of war. In the end, the Emperor decided to conciliate the Americans by granting them their less important demands, and at the same time to prepare his country for defense. New forts were constructed along the coast, numerous cannon and bombs were cast, and three hundred thousand patriots repaired to Yedo.[88]

Soon after the *Susquehanna* arrived at the American anchorage, some Japanese officers came alongside her with a message from the Emperor. They were referred to Perry's representative, Commander Adams, who they informed that the Emperor had given orders to receive the fleet in a most friendly manner, that he had appointed five commissioners of high distinction to meet Perry and consider with him the propositions contained in the President's letter, and that a town called Kamakura, about twenty miles below Uraga had been designated as the place of meeting. This news was highly satisfactory to Perry, with the exception of that respecting the meeting place, to which he strongly objected. On learning of his objections, the Japanese proposed Uraga, where they had already begun to erect a council-house. This proposal Perry also rejected, urging the inconvenience of Uraga and its unsafety as an anchorage for his ships. For more than a week the question of a meeting place was discussed, neither side being willing to yield to the other. Finally, to expedite a settlement, Perry sailed up the bay with his fleet within sight of Yedo and within hearing of its bells. Soon after this movement was effected, the Japanese, fearing that the Americans intended to visit Yedo, proposed that the meeting be held on the beach near Yokohama. As this place was quite suitable and convenient, Perry accepted it. Here the Japanese erected a council-house, and Perry moored his ships near by, covering with his guns the shore for a distance of five miles.

The president of the Japanese commission was Hayashi, prince counsellor, and chief professor of the Chinese language and literature at the Great University of Japan, a profound scholar and dignified gentleman. Three of the other four members had the rank of "princes." By March 8 the commissioners and Perry

[88] Nitobe, I. O. The Intercourse between the United States and Japan 48-51.

had completed their preparations for the meeting. The second landing of the Americans was marked by even greater pageantry than the first. As this feature is not especially dwelt upon by Perry in his official account, from which the following extract is taken, it may be passed over without further notice:

At 11.30 a. m. on the day appointed, the escort, consisting of about five hundred officers, seamen, and marines, fully armed, embarked in twenty-seven barges, in command of Commander Buchanan, and, forming a line abreast, pulled in good order to the shore. The escort having landed and drawn up, I followed in my barge under an appropriate salute, and landing, was received by the escort and a party of Japanese officials, and conducted to the hall prepared for the conference, where I found in waiting the five commissioners, and was invited to be seated opposite the chief personage.

At this moment salutes were fired from the howitzers mounted in the launches, of twenty-one guns in honor of the Emperor, and seventeen for the Japanese commissioners. This display in landing was made altogether for purposes of policy, in accordance with the reasons already assigned.

After suitable interchanges of courtesy, I was requested to retire, with my suite, to an inner apartment, where the necessary business could be conducted undisturbed. Accordingly, accompanied by the captain of the fleet, the two interpreters, and my secretary, I withdrew with the commissioners to an adjoining room, separated from the principal hall by a flag suspended across the entrance. Refreshments having been served, a reply to the letter of the President presented in July last was handed to me and translated from the Dutch by Mr. Portman, and I replied to it verbally. I then handed to the chief commissioner a draught of a treaty, which I had previously prepared as the basis of one which I was desirous of negotiating with the Imperial government. This was accompanied by three other papers—one being a reply to the communication of the chief commissioner addressed to me from Uraga . . . ; another, a statement of my views with respect to the policy of bringing about a mutually advantageous compact between the United States and Japan . . . ; and the third, a memorandum . . . in further explanation of the motives which would govern me in conducting the negotiations, and asking for certain relaxations of the Japanese laws with respect to the squadron.[27]

On the conclusion of these preliminaries, the commodore informed the commissioners that a marine had recently died on board the *Mississippi*, and that he wished to bury his body at some suitable place on shore. The commissioners replied that the body would have to be taken to Nagasaki for burial. Perry raised objections to this disposition of it, proposing that it be interred on Webster Island, near the American anchorage. The commissioners strongly opposed this suggestion, but finally consented to permit the interment to take place at a spot adjoining

[27] Sen. Ex. Doc., No. 34, 33 Cong., 2 sess., pp. 125-126.

one of the temples in Yokohama. Perry was somewhat disappointed at the turn taken by the incident as he had hoped to acquire an interest in Webster Island with a view to subserving "some ulterior objects." On fixing the burial place of the marine, the first conference came to an end.

The Emperor's answer to the President's letter disclosed that he was willing to concede much respecting the relief of distressed mariners and the establishment of ports of resort, but that he was unwilling to open Japan for purposes of trade. At first Perry urged the commissioners to negotiate with him a treaty granting the United States the rights of commerce, threatening them with the possibility that his government would send out more ships and men "with instructions of more stringent import." He soon discovered, however, that it was impossible to obtain a concession of commercial privileges, and he therefore turned his attention to procuring favorable terms respecting the points conceded. The Japanese were willing to open two ports of resort for American ships, Nagasaki immediately, and one other port after five years. Perry obtained the substitution of Shimoda, a more convenient port, for Nagasaki, the designation of Hakodate as the second port, and the reduction of the interval preceding the opening of the second port to one year. He also obtained a provision granting shipwrecked sailors temporarily living at the two ports of resort considerable freedom of movement and complete immunity from such restrictions as the Dutch and Chinese were subjected to at Nagasaki, and he secured the concession to the United States of all privileges that should be subsequently granted to other nations. At his suggestion the right of sending an American consul to reside in Shimoda was granted.

Several conferences were held at the council-house near Yokohama before the treaty was completed on March 31, when it was signed by Perry and the commissioners. During the negotiations the Japanese and their visitors showed each other many courtesies. Presents were both given and received by them. Among those presented by Perry to the Japanese were a collection of rifles, muskets, swords, pistols and carbines, a cask of wine, one hundred gallons of whisky, several baskets of champagne, a box of perfumery, a telescope, two telegraphic instruments, three life-boats, one locomotive with tender, passenger car, and rails, four volumes of Audubon's Birds of America, eight baskets of Irish potatoes, and numerous agricultural implements. The natives were much

interested in the locomotive and telegraphic apparatus, which were set up on shore and operated for their instruction. The gifts presented by the Japanese included two bundles of rice, three hundred chickens, gold lacquered writing implements, paper boxes, and book cases, some pieces of pongee, crape and silk, twenty umbrellas and thirteen dolls.

Perry dined the commissioners and their retinues on board the *Powhatan*, receiving them with all the honors and attentious due to persons of high rank. The fleet displayed the Japanese flag, the first time this emblem ever floated from the mast-head of foreign ships of war. In accordance with the Japanese custom, the subordinates were not seated with their superiors. A table for the commissioners, Perry and his captains was spread in the cabin, while the lesser notables dined on the quarter-deck. The visitors did full justice to the American viands, and having eaten to satiety, they after the manner of their country wrapped up and took with them the remnants of the feast. One of the commissioners fancied a large cake and was presented with it by the commodore, together with some cordial. Under the mellowing influence of the American wines and liquors, the visitors became exceedingly social, and a few even hilarious. The friendship of Nippon and America was frequently toasted, and many sentiments of mutual good will were expressed by host and guest.

On the fourth day after the treaty was signed, Commander H. A. Adams was dispatched to Washington with a copy of it, taking passage on board the *Saratoga* for San Francisco. Perry's work in Yedo Bay was practically completed. Before leaving, however, he got his fleet under way and approached near enough to Yedo to ascertain that it could be destroyed by a few light-draft steamers carrying guns of the heaviest calibers. On April 18, the slower vessels having already sailed, Perry with the *Powhatan* and *Mississippi* left the scene of his great achievement and proceeded to Shimoda. Thence he visited Hakodate, and from that place returned to Shimoda. The harbors of these ports were surveyed, friendly relations were established with the local governments, and cemeteries for the burial of Americans were located. At Shimoda the commodore met the Japanese commissioners and together they adopted some new treaty regulations, relating in part to the limits near the two ports within which the Americans were to be free to go and come, the landing places for vessels,

and the sale of goods. Finally on June 28 Perry sailed for China by way of the Lu-chu Islands. At Napa he entered into a compact with the government, granting to Americans the same rights in the Lu-chus that the treaty of Yokohama gave them in Japan. On July 21 he arrived at Hong Kong.

For some time the commodore had been unwell, suffering from bodily ailments and worn out by the cares and duties of his trying office. In December, 1853, he had written to the Secretary of the Navy asking permission to return home when his negotiations with Japan should be completed. At Hong Kong he received the orders he had requested, and on September 11 he sailed from that port on the British mail steamer *Hindostan* for England by way of the Red Sea and the overland route. On January 11, 1855, he arrived in New York on the steamer *Baltic*, having been absent from the United States two years and two months. His flagship *Mississippi*, returning home by way of the west coast of South America, reached New York on April 22, and on the following day she was visited by Perry. As he left her to go ashore his broad pennant was hauled down, thus formally terminating his connection with the East India squadron.

The opening of Japan was a memorable achievement, whether viewed as an international spectacle, a difficult task, or an historical event. Its spectacular features arrested the attention and kindled the imagination of the whole civilized world. The surmounting of its difficulties might well have challenged the ablest statesmen of the century. Perry's success was in no small measure the result of a rare combination of strong qualities of character—firmness, sagacity, tact, dignity, patience and determination. The opening of Japan was one of the great historical events of the last century, the farreaching effects of which are still but partially revealed.

For several months after Perry's return to the United States, he was employed at Washington in preparing a history of his expedition. In 1856 this was published by the federal government in three large volumes at a total cost of three hundred and sixty thousand dollars.[33] On the completion of his labors as author and editor, he returned to his home in New York City, where he died after a brief illness on March 4, 1858.

(TO BE CONTINUED.)

[33] Griffis, W. E., Matthew Calbraith Perry, 385.

PROFESSIONAL NOTES.

Prepared by Professor Philip R. Alger, U. S. Navy.

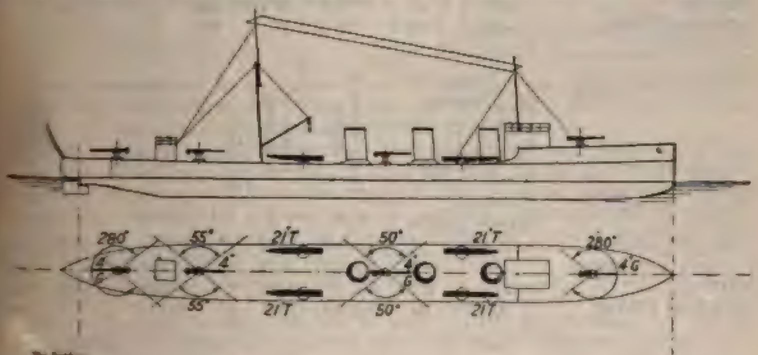
SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rivadavia	28,000	Fore River Shipbl'dg Co.	Building.
Moreno	28,000	New York "	"

The accompanying sketch illustrates the new type of Argentine ocean-going destroyers now being built in England, France and Germany. The rigging and general arrangement shown in the sketch are those of the boats ordered in Germany and France, and differ from the vessels which



are being built at Cammell Laird's mainly in the number of funnels, of which there will be five in the English-built boats. The stern of the English boats will also slightly differ from the continental boats, but otherwise the whole flotilla—twelve boats—of new Argentine destroyers will be composed of practically identical ships.

It will be recalled that at the beginning of last year, after a competition which had lasted many months, the firms of Cammell Laird, Krupp (Kiel), Chantiers de la Brétagne (Nantes), and Schichau (Elbing) secured contracts for building respectively four, two, four, and two boats, the first twelve units of a powerful flotilla which is contemplated in the program of reconstruction of the Argentine Navy. The principal data of these vessels are given in the table below.

The designs of these boats are the result of a most elaborate and laborious examination of plans submitted by more than twenty firms which were invited to tender at the beginning of 1909. The competition was repeated after a first elimination, and at the conclusion of the second examination a

final inquiry was sent out to a restricted number of competitors who tendered for the definite designs adopted.

With regard to gun power the Argentine destroyers are, perhaps, overgunned. They carry four 4-inch 50-caliber pieces, with a magazine capacity of 250 rounds for each. The weight of metal thrown aggregates 132 pounds. The considerable increase of gun power in the latest British destroyers justifies the great importance given to gun mountings in the Argentine vessels. In the *Afridi* type of the *Tribal* class two 12-pounders were added to the original three, thus increasing the weight of metal thrown from 37½ pounds to 62½ pounds, and the types which have succeeded the *Afridi*—the *Amazon, Beagle* and *Acorn*—throw 50 pounds, 62½ pounds, and 75 pounds of metal respectively. In the latest foreign torpedo craft designs the tendency is to increase the caliber and length of bore, as the Argentine boats show, and in some navies the possibility of mounting 12 cm. 50-caliber guns (4.7-inch) is now being studied.

Where building.	Length.	Beam.	Depth.	Draft.	Trial displacement.	Six hours' trial speed.	Full equipment displacement.	Full equipment draft.
	ft.	ft. in.	ft. in.	ft. in.	tons.	kts.	tons.	ft. in.
Cammell Laird	292.9	27 7	17 1	8 6	980	32	1175	9 10
Krupp (Germania)...	288	27 1	17 1	8 2	935	32	1140	9 6
Nantes	289.7	28 2	18 1	8 10	940	32	1170	10 2
Schichau Elbing.....	295.2	29 7	16 5	7 7	885	32	1110	9 2

	Fuel capacity.		Horse-power of turbines.	Number of revolutions.	Boilers.		Steaming radius.
	Coal.	Oil.			Number.	Type.	
	tons.	tons.	H. P.				miles.
Cammell Laird	225	75	20,000	600	5	White Forster	3000
Krupp (Germania)...	250	110	19,500	600	5	Schulz	3000
Nantes..............	256	82	19,500	650	5	White Forster	3000
Schichau Elbing.....	290	50	19,500	600	5	Schulz	3000

The Argentine destroyers, like the boats of the *Beagle* and *Acorn* classes, will carry the new 21-inch torpedoes, being fitted with four tubes arranged as shown in the sketch. The new 21-inch Whitehead weapon carries a charge of 150 kilos (331 pounds) gun-cotton, and has speeds of 41 and 29 knots at a range of 2000 meters and 5000 meters respectively.

The great radius of action of the new Argentine turbine destroyers makes of these vessels also very valuable strategical units. With an average of 250 tons of coal and 80 to 100 tons of oil, they will be able to steam practically 3300 to 3500 miles at 14 to 15 knots. The boats are therefore available for service at great distances from home naval bases—Buenos Ayres, La Plata, and Bahia Blanca—and will be able to operate in the South Atlantic as well as in the South Pacific.

The boats are fitted with wireless telegraphy, having a radius of operation of 200 kiloms. Their complement aggregates 110 officers and men.

The system of turbines adopted will be the Curtis impulse type, driving twin-screws. Though the projected motive power varies between 19,000 and 20,000 shaft horse-power, it is expected that the actual full power at the trials will average 22,000 horse-power.—*The Engineer.*

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Radetzky	14,500	Trieste.	Under trial.
Zrinyi	14,500	"	Launched April 12, 1910.
Erzherzog Franz Ferdinand	14,500	"	Under trial.
Tegetthoff	19,300	"	Building.
Kaiser Franz Joseph	19,300	"	"

The program of shipbuilding laid before the Austro-Hungarian Delegations by Admiral Count Montecuccoli is admittedly far below the expectations of those who wish to see the maritime strength of the Dual Monarchy placed on a broad and substantial foundation. The aggregate tonnage represented by the program, which is to extend over six years, is hardly greater than the German program for one year. The full details are as follows:

	Kroner.
Four battleships, each displacing circa 20,000 tons. Total inclusive cost	242,400,000
Three cruisers ("*G*," "*H*," "*J*"), each displacing 3500 tons. Total inclusive cost	30,000,000
Six torpedo-gunboats, each displacing 800 tons. Total inclusive cost	18,000,000
Twelve ocean-going destroyers. Total inclusive cost	12,000,000
Six submarines. Total inclusive cost	10,000,000
Grand total	312,000,000

Appropriations will be made each year from 1911 to 1916 inclusive, the amounts for 1912, 1913, and 1914 being the heaviest. Provision is also made for an increase of 800 in the personnel this year.

A most interesting announcement is that the Hungarian yard at Fiume, that of the Danubius-Gesellschaft, is to build one of the four battleships, in addition to six gunboats, as the company has given a pledge to provide all necessary facilities by a given date. In regard to the other three battleships, two are now being built at the Stabilimento Tecnico yards at San Marco, and the third will also be constructed there.

The formation of a Marine Ministry, distinct from the Ministry of War, has evidently been decided upon, as Admiral Count Montecuccoli, who had previously occupied what is known as the "dritte Rangklasse," or third-class rank in the Imperial Councils, has just been appointed to second-class rank, which indicates Ministerial status. As is well known, there is at present no self-contained Austro-Hungarian Admiralty, the administration of the naval service being subordinated to the Kriegsministerium and officially designated the Marine Section. In the year 1862 Archduke Ferdinand Max succeeded in founding an actual Marine Ministry when he was appointed to control the fleet, but after his departure for Mexico the old system was re-established, and has obtained ever since. In the near future, however, the change foreshadowed by the promotion of Admiral Count Montecuccoli will in all probability be made. The Stabilimento Tecnico yard at Trieste has anticipated government requirements by laying down two *Dreadnoughts* at their own risk. The construction of the first ship, the *Kaiser Franz Josef*, was started in April, 1910; and the second, the *Tegetthof*, in September. It is proposed to launch the former in August, 1911, and to have her ready for trials by the autumn of 1913. The second will be launched in February, 1912, and will probably be completed in the spring of 1914. The vessels under construction have a displacement of 19,300 tons, and their machinery of 25,000-horse-power is expected to give them a speed of 22 knots. The primary armament consists of ten

12-inch guns, and the secondary of twenty-four 4.1-inch quick-firing guns. The main armor belt is 11 inches thick, and four submerged torpedo tubes will be fitted.

Austria has at present five modern battleships in commission, and although these are not of *Dreadnought* importance, they are vessels of considerable strength, being well armed and armored, and having good speed. Besides these there are eight battlships of less fighting value (probably of little use against modern big guns), three armored cruisers, six protected cruisers, twelve destroyers, forty-two torpedo-boats, and four submarines. These do not include several vessels nearing completion.—*Naval and Military Record.*

With the close of January some important changes in the constitution of the Austro-Hungarian fleet have been made, notably in the battleship squadron. The battleship *Erzherzog Friedrich,* which has been in constant commission since January, 1907, has been relegated to the First Reserve, and is replaced by the *Radetzky.* By next May or June the various squadrons will be composed as follows:

Active Battle Fleet—*Erzherzog Franz Ferdinand, Radetzky,* and *Zrinyi,* 14,500 tons; speed, 20 knots; guns, four 12-inch, eight 9.4-inch. *Erzherzog Ferdinand Max,* 10,600 tons; speed, 20 knots; guns, four 9.4-inch, twelve 7.6-inch. *Kaiser Karl VI,* 6325 tons; speed, 20 knots; guns, two 9.4-inch, eight 6-inch. Two torpedo-gunboats and six destroyers.

First Reserve—*Erzherzog Karl* and *Erzherzog Friedrich,* 10,600 tons; speed, 20 knots; guns, four 9.4-inch, twelve 7.6-inch. *Babenberg,* 8340 tons; speed, 19 knots; guns, three 9.4-inch, twelve 6-inch. *Sankt Georg,* 7400 tons; speed, 21 knots; guns, two 9.4-inch, five 7.6-inch. *Maria Theresia* and *Zenta* and three destroyers.

Two battleships, *Arpad* and *Habsburg,* have been withdrawn from the Reserve in order to undergo reconstruction, which may involve a reduction of the secondary battery. In the Second Reserve are the obsolescent battleships, *Wien, Monarch,* and *Budapest,* and the cruisers *Kaiser Franz Josef* and *Szigetvar.* The new scout *Admiral Spaun* is attached to the active battle fleet. It is further proposed to create two special torpedo divisions for the defence of the Dalmatian coast. At present there are fifty-four destroyers and boats built or building, with an average speed of 27 knots. To the coastal flotilla will be assigned the depot-ship *Pelikan* and two gunboats.—*Naval and Military Record.*

BRAZIL.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
São Paulo	19,250	Vickers.	Under trial.
Rio de Janeiro	32,000	Elswick.	Ordered.
Scouts.			
Bahia	3,500	Elswick.	Under trial.

THE NAVAL MUTINIES.—The exact inwardness of the Brazilian naval mutinies is not easy to discover. The official view is that they result from trivial causes which can be remedied easily. After the mutiny, however, the demand of the rebels for the abolition of corporal punishment was acceded to, as well as an increase in the strength of the crews, and an amnesty was granted. Now we have the mutinous crew of the cruiser *Rio Grande do Sul,* in association with a battalion of marines stationed in the Cobras Island, bombarding the capital, and herself under fire, one officer and some men being killed, and probably the new ship herself damaged. If the mutinies have a political character, they may be associated with a separatist tendency supported from the South. The unsuccessful revolt of 1893, headed by Admiral Custodio de Mello, and carried to the

er end by Admiral Saldanha da Gama, had for its avowed purpose the rthrow of the government of Marshal Peixoto, and not improbably the titution of a separate government in the South. Prominent officers were olved, in which the revolt appears to have differed from recent out-aks, but time will show whether like objects are not at the root of the uble.

From these episodes the Brazilians may derive a useful lesson. It is that leet does not consist of a couple of battleships fitted from stem to stern l keel to masthead with the latest devices of science, accompanied by a tain number of cruisers and destroyers. It consists still more of triotic, keen, zealous, and efficient officers, and of disciplined, well-ined men. It is to be feared that the Brazilians have taken too material view of their naval requirements, and have forgotten that the man is re than the machine. If the real fount of naval efficiency—namely, loy-y to the government—is wanting, there is perhaps nothing more to be d, except that the Brazilian taxpayers have been deceived into the pur-se of very expensive equipments which are more likely to be a danger them than anything else. The discipline of the cabin and ward-room icers, as St. Vincent said, is the discipline of the fleet, and that is where : Brazilian authorities must institute reforms if the new fleet is to be of y use.—*Army and Navy Gazette.*

CHILI.

The efforts now being made by the Chilian government to recover some-ing of its past pre-eminent position among the South American republics a naval power will be followed with the keenest interest in this country. le Chilians do not forget the services of Cochrane, whose name is still memorated in a ship of their fleet, while British naval men will always preciate the achievements of the navy to which he lent his aid, and the llant way in which its tradition has been upheld by his successors. An eresting reminder of this historic association between Chili and Great itain was afforded recently by the appointment of Commander Charles lane, R. N., to the command of the Chilian Naval War College. Captain lane has been lent by the Admiralty for a period of two years, and he s just left England to take up duty in Chili. It is evident, therefore, at in reorganizing her naval forces, Chili is paying attention to other portant details besides the provision of ships. Her naval program in-ides two battleships, several ocean-going destroyers, and a submarine tilla, and tenders for the work are to be opened in April.—*Army and ny Gazette.*

Tenders will be opened in London and Washington on April 5 for two ttleships of 25,000 tons, provided with 13-inch guns, for the Chilian ivy.—*Reuter.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
iton	18,350	Brest.	Launched July 4, 1909.
abeau	18,350	Lorient.	" Oct. 28, 1909.
taire	18,350	Bordeaux.	Under trial.
erot	18,350	St. Nazaire.	Launched Apr. 19, 1909.
dorcet	18,350	"	Under trial.
gniaud	18,350	La Seyne.	Launched Apr. 12, 1910.
rbet	23,500	Lorient.	Building.
1 Bart	23,500	Brest	"
Armored Cruisers.			
leck-Rousseau	13,644	Lorient.	Launched Mar. 4, 1908.

The *Moniteur de la Flotte* gives a summary of the progress made by th French Navy in 1910. The two battleships *Jean Bart* and *Courbet* wer ordered in October and November. In February two destroyers of 45 tons, *Enseigne Henry* and *Aspirant Herbert,* were put in hand at Roche fort. Private yards have received orders for five destroyers of 750 to 7 tons—*Capitaine Mehl, Dehorter, Francis Garnier, Commandant Bory,* an *Commandant Rivière.* Latterly orders have been given for the destroye *Bisson* and *Renaudin* at Toulon; *Protet* at Rochefort; and the *Mag Mangini,* and *Commandant Lucas* in private yards. In addition to the the submarines *Clorinde* and *Cornélie* have been ordered at Rochefort, an the *Gustave Zédé* at Cherbourg. A salvage dock for submarines has bee put in hand at Saint Nazaire. Delay in the delivery of the petrol moto of the *Faraday, Volta,* and *Amiral Bourgeois* caused loss and delay in th construction of these submarines, but some of the time may be recovere The motors of the *Newton* and *Montgolfier* are to be delivered in Febru and March. The delays caused at Rochefort by failure to deliver machi ery at the appointed date made it necessary to defer the laying down o the *Protet* until the close of the year.

THE NAVAL YARDS.—In the report on the *Budget* concerning naval ma ters, which is given in abstract in the *Moniteur de la Flotte,* the questi is asked as to whether it is necessary to maintain the six existing Frenc naval yards—Cherbourg, on the Channel; Brest, Lorient, and Rochefort, o the Atlantic; Toulon, on the Mediterranean; and Bizerta, in Tunis. It remarked that Great Britain has only three large naval yards, and Germa two only. Cherbourg occupies a unique military situation, which rende it an important "center for flotillas." It should be maintained for the co struction of small and medium size units exclusively, and for the revictua ling of the French fleet. Brest, on the Atlantic, is in quite as favorable situation as Cherbourg; owing, however, to the size of modern battlesh the space available in the Brest anchorage is barely sufficient. Basi should be excavated outside the river in the roadstead, breakwaters bei built as a protection against the heavy swells coming from the ocean, a large docks provided; work, for increasing the facilities at Brest, sho be commenced immediately on an adequate scale, this being cheaper in t end than piecemeal operations. The question as to whether Brest arse should be fitted up to build large units, or, as Toulon, maintained for carr ing out repairs only, is disputed. Some authorities state that when a buil ing-yard and repair-shops are in too close proximity new constructions a much too long on the stocks, since men are constantly being taken fro new work to carry out repairs; others ask that there be a large amount c labor available for distribution, both on repair work and new work, thi being the best means for keeping the various gangs occupied, and for uti izing the docks and basins, thus reducing general expenses. Lorient ca no longer be considered a military harbor; no further funds should be ex pended upon it for facilitating the entrance and egress of large units. I should remain a shipyard, the hulls built at Lorient being towed to Bre for fitting out. The remarks concerning Lorient apply with more force t Rochefort; this might, however, remain a revictualling center. Toulon indispensable to the fleet; its importance from the military point of view acknowledged. It appears undesirable to the reporter on the *Budget* t contemplate building at Toulon large units for the fleet; the yard, mor over, finds sufficient employment in repair work. The roadstead, howeve requires deepening, and the docks and basins require enlarging. Bizert as an arsenal, was satisfactory from the commencement, but part of th works have been erected at a distance, outside the fortified portion, so a to shelter them from the firing of an enemy lying in the Mediterranea The report concludes by suggesting the maintenance of Brest and Toulo as military harbors, Cherbourg and Bizerta forming two naval yards Lorient could for the present be maintained as it now stands; Rochefo

would be done away with, the small units being built exclusively at Cherbourg and Toulon. We should have liked to find in the report in question reference to the French private shipbuilding yards which are distributed round the coast, and are fully able to build and equip the largest units under reasonable conditions as regards time and cost.—*Engineering.*

WORLD'S LARGEST SUBMARINE.—The *Mariotte*, the largest submarine in the world, having a displacement of 1100 tons, was successfully launched at Cherbourg on Feb. 7.

The displacement of the *D* class of submarines in the British Navy is 600 tons.

Experiments in wireless telephony, which have been carried out by the French battleships *Justice* and *Verité*, have given excellent results. It was found that conversation could easily be heard at a distance of 72 miles.

NEW DRY DOCKS.—Two ports on the western coast of France have each recently completed a large dry dock. These ports are St. Nazaire and Bordeaux. Each of these docks is large enough to accommodate any French warship either existing or to be built in the near future, and the former will be able to receive any vessels of the mercantile marine which, so far as can be foreseen, are likely to be constructed in France for some time to come.

It was certainly high time that a dry dock of reasonable size was provided at St. Nazaire. The battleships *Diderot* and *Condorcet*, which were launched last year at that port, lay until the new dock was ready with some of their launching gear adhering to their hulls simply because there was no dock which would take them in. The work of construction was finally taken in hand by the St. Nazaire Chamber of Commerce, acting in conjunction with the two leading shipyards of the district, Les Ateliers et Chantiers de la Loire and Les Chantiers de l'Atlantique, and carried to a successful conclusion, each bearing a share of the cost. This action is worthy of notice, as it is quite contrary to French customs as a rule to carry out such work by private enterprise and without the assistance of the State.

The main dimensions of the dock are:

	Feet.
Total length	757.7
Length available for use	738.0
Maximum width at entrance	114.83
Width on floor at entrance	98.43
Maximum width of dock, including platform	125.33
" " " " excluding "	114.83
Width of dock on floor	104.99
Minimum depth over sill at low water	24.48
Depth over sill at ordinary high water	28.87
Maximum depth over sill at equinox	30.19

The dock at Bordeaux is due to the Gironde Works, which are at Lormont on the Garonne at some distance from the harbor and even more exposed than it to strong currents and heavy tides. In order to cope with this difficulty all vessels built by this firm have, till quite recently, been launched with engines in place and boilers under steam. The dimensions of the vessels have, however, increased so rapidly that the weights to be manipulated have become excessive. *La Verité*, for example, had a launching weight of 12,000 tons. Moreover, it became increasingly difficult to get the heavy weights necessitated by the introduction of modern high-powered engines into the boats. In the case of the last warship built, the turbines were of 22,500 horse-power, and it was found impracticable to get them into position while the vessel was on the stocks. Accordingly this

method has now been abandoned in all cases. It was at first proposed make a floating dock protected from the action of the currents by sc system of baffles. It was, however, found that suitable land was availa and that the cost of constructing a dry dock on shore would not be v much in excess of that of the floating dock. The dry dock was accordin built and it has the following dimensions:

Total available length	594 ft.
Width at quay level	121 ft. 5 in.
Width at entrance	108 ft. 3 in.
Depth of water with a 16 ft. 5 in. tide	32 ft. 10 in.

It may be added that the dimensions of two 23-000-ton battleships wh are to be laid down at the Gironde Works are: Length, 542 feet, extre beam 88 feet, and draft 29 feet 6 inches, so that they will easily accommodated in the new dock.—*The Engineer.*

TRAINING FOR HIGH COMMAND.—The *France Militaire* develops so conclusions on the subject of the "Centre des Hautes Etudes Militair which began its operations on Jan. 15. This seat of learning and instr tion, which is to exercise higher duties than the Ecole de Guerre, owes origin to the personal influence of Gen. Brun, Minister of War, and object is to prepare selected officers for higher staff duties and comma The first result will be to facilitate the choice of officers for import appointments. It gives to the Minister a great and necessary privilege, it also imposes upon him the gravest responsibility. In view of this he thought it wise to surround his preferences with proper guarantees ba upon intellectual and physical tests. But the Minister had another id Making the Army staff and the Superior Council of War share in duties, he hopes to see these organizations actually at work. The staff the Army, which is the brain of the military organizations, had confided it the "production" of the new course of high studies. A new funct has been provided for the staff, and the general will have it under cl observation. The *France Militaire* holds the view that the new organi tion provides a veritable school, in the most elevated sense of the wo for the high command.—*Army and Navy Gazette.*

ARMAMENT OF FUTURE BATTLESHIPS.—On Jan. 16, a meeting was h under the presidency of the Minister of Marine of the Conseil Superie comprising, in addition to the four inspectors of the fleet, Admirals de Jo quières and Jauréguiberry, as well as the head of the Ordnance Depa ment. The question of the armament of future cuirassés was put on tapis, and the discussion is said to have been highly animated and intere ing, as will be readily understood when it is known that the Council w confronted with most momentous proposals, viz., the discarding of t *Courbet* type of battleship, and of the tried and now thoroughly effici 305-mm. weapon, together with the abandonment of the powerful ax fire, traditional in the Gallic Navy, in favor of the center line of turrets adopted in the British and American Navies. The distinguished memb were asked to take into consideration the following facts, viz.:

1. Superior quality was the only way to make up for the numeri deficiency of the French fleet.

2. Superior gun-power consists of the superior destructive power of t guns, combined with sufficient rate of fire.

3. Excellent as are the latest 305-mm. designs, there cannot exist t much margin of penetration, too much exploding capacity in the she with the long-range contests of to-morrow and the ever-improving qual of modern armor.

4. To strike hard and to force on decisive and immediate results is t best, most economical, and most "truly military" way of fighting.

5. The great difference in the rate of fire which existed between the very heavy ordnance (340, 370, and 420 mm.) of 25 years ago, and the medium-sized guns of the same period has been considerably reduced by the progress of mechanical science, and the new 340-mm. weapon, prepared by the Direction d'Artillerie, will fire nearly as fast as the 305-mm. of the *Dantons* a shell far heavier (nearly 600 kilos) and containing a greater quantity of melinite.

6. An increase in the caliber of the heavy guns was the only means, really effective and economical, to add to the power of a 12-turreted ship like the *Courbet*—although triple 12-inch turrets might be advocated.

7. It can never be wise policy to run encounter to the trend of progress, and the French Navy would obviously be courting dangerous inferiority towards her perspective rivals by sticking to the 305-mm. weapon.

8. The American and English system of center-line turrets—which the French marine applied 27 years since in her *Baudin* and *Formidable*—presents the greatest number of advantages (especially with very heavy guns) both from the military and constructional standpoints. The practical (and total) arc of fire is greater in the U. S. *Arkansas* than in the *Courbet*, whilst on the other hand axial fire need not be sacrificed since the extreme turrets are at different levels and may be made (at least the lowest) to contain 3 guns instead of 2.

9. The disposition of the amidship turrets in echelon, like in the British *Neptune* and in the Argentine new ships, is not without drawbacks from a constructional point of view, and, moreover, it does not permit, so well as the center-line of turrets, to concentrate the whole of the heavy armament on an enemy.

10. The discarding of the *Courbet* type will entail no delay in the construction of the future cuirassés, the active and able Constructor Lyasse having prepared designs (24,000 and 25,700 tons) embodying the desired change in the caliber (a) 5 twin 340-mm. turrets, (b) 2 triple 340-mm. turrets and 3 twin turrets.

11. As to the small armament, the 140-mm. weapon, which allows easy handling, quick loading and firing, is generally judged with its 80-pound shell to answer all requirements. The only question to be decided upon is as to the advisability to replace the twenty-two 140-mm. guns in four redoubts, as in the *Courbet*, by sixteen similar weapons in eight thickly armored twin turrets on the upper deck, this reduction in number being compensated by greater command and arc of fire, and on the whole by better utilization.

No definite decision, it is understood, was arrived at, though Admiral de Lapeyrère is credited with the firm intention to carry out his own views and to see that the service, of which he has charge, benefits to the full with the progress of naval science. A compromise is possible in the case of the two ships of the 1911 program.

Despite the delay which will take place in the discussion of the Lapeyrère naval program, no doubt is now entertained in political circles that this important naval law will be voted in the spring and, for some time at last, impart some sorely needed stability to the policy of the Rue Royale. Mons. Delcassé, the much-respected statesman who has rendered immense service to the "marine française," in bringing about the retirement of the incompetent previous civilian Ministers, is employing the influence which he enjoys among all parties in the Chamber, in favor of the projected program, which he caused last week to be endorsed officially by the "gauche radicale" party, which is the dominant factor in parliamentary votes. On the other hand, the "groupe des interêts maritimes," which comprises 150 members, has also given its complete and unreserved support to the "organic law." There is in these significant manifestations a sign that the vital importance of sea-power begins to be realized in the French Chamber.

Putting aside the systematic—and futile—opposition of the Socialists, the Lapeyrère naval program is certain to be criticised as erring on the

side of moderation. At the same time, it is unjust to say that the p takes no account of the superior financial resources of the Repul represents a gradual, well-sustained, and permanent effort, withou upon the finances of the country, whilst the German and Italo-A armaments are fundamentally spasmodic and ephemeral, being su by borrowed money, by abnormal and exceptional means.—*Nat Military Record.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Ost Friesland.........	19,000	Wilhelmshaven.	Launched Sept.
Thüringen	19,000	Bremen (Weser Yard).	" Nov.
Helgoland	19,000	Kiel (Howaldt).	" Sept.
Oldenburg	19,000	Danzig (Schichau).	" June
Ersatz Hildebrand ...	20,000	Kiel (Kaiserliche W.).	Building.
" Heimdall......	20,000	Hamburg (Vulkan).	"
" Hagen..... ...	20,000	Kiel (Howaldt).	"
" Aegir..........	20,000	Danzig (Schichau).	"
" Odin.....	21,000?	Wilhelmshaven.	"
" K. Friedrich Wilhelm ...		....	Authorized.
" Weissenburg..		....	"
" S		....	"
Armored Cruisers.			
Moltke................	21,500?	Hamburg (Blohm and Voss).	Launched April
H.............	21,500?	Do.	Building
J	21,500?	Do.	"
K		....	Authorized.
Protected Cruisers.			
Kolberg...............	4,300	Danzig.	Under trial.
Koeln	4,350	Kiel.	" "
Augsburg.............	4 350	"	" "
Ersatz Bussard.......	4,500 ?	Stettin (Vulkan).	Building.
" Falke..........	4,500 ?	Bremen (Weser).	"
" Cormoran.....	4,500 ?	Bremen (Weser).	Ordered.
" Condor........	4,500 ?	Wilhelmshaven.	"
" Seeadler	.....	....	Authorized.
" Geier..........	.....	....	"

THE 1911 ESTIMATES.—The German Navy estimates for 1911 amo a total of £22,527,888, including recurring expenditure on ordinary c of £8,360,624 (an increase of £493,916), non-recurring ordinary expe of £13,200,141 (increase £371,727), and extraordinary expenditure of 995. The sum to be raised by loan is £4,486,000. It should be ob that the naval outlay of Germany, vast as it is, has never reach amounts contemplated in the financial scheme of the Navy Law o Thus the scheme contemplated in 1910 an expenditure of £21,940, which £6,250,000 would be raised by loan, while the actual demar about £600,000 less and the amount met out of loans was £5,550,0 1911 there would be a total of £23,085,000, including £6,225,000 to co of loans. It will be seen that the actual estimates are more than million below the sum contemplated as possible in the scheme, wh amount to be raised by loan is very considerably less. The votes fo building and armaments, which attract chief attention, amount to £ 650, being an increase of £331,150, under the following heads: Ne

struction, £7,960,000 (increase £240,500); ordnance, £3,862,000 (increase £70,000); torpedo armaments, £478,500 (increase £24,500); and mining requirements, £82,650 (increase £32,650); while the sum asked for repairs is £125,000, being a decrease of £36,500. Provision is made in greater or lesser degree for 16 battleships and battle-cruisers belonging to the programs of four successive years. The completion of the *Ostfriesland*, *Helgoland*, *Thuringen*, and *Moltke* is the first item. These ships were said by Mr. McKenna to have been expedited for completion in 1910, but they are down for completion in the spring and summer of 1911, the new estimates containing the final charges. The third instalments are included for the ships of 1909—*Oldenburg*, *Ersatz Heimdall*, and *Ersatz Hildebrand*, and the battle-cruiser *H*. But the sums demanded are £500,000 less than those in the estimates of 1910. Nor should it be forgotten that the *Oldenburg* and *H* were said to have been accelerated. The new estimates also include the second votes for the *Ersatz Hagen*, *Ersatz Aegir*, *Ersatz Odin*, and the battle-cruiser, which have just been laid down and are to be completed in 1913. The new construction to be provided for in 1911 is three battleships and one battle-cruiser in addition to the customary two "small" cruisers and the division of 12 destroyers.

In criticism of the estimates Capt. von Pustau, a retired naval officer, points out in *The Tägliche Rundschau* that the annual expenditure for the navy has increased from £9,750,000 in 1901 to £22,500,000 in the year 1911, and that the total sum expended on the fleet until the end of the financial year 1911 is £161,000,000—that is to say, £1,700,000 less than originally calculated. He notes further that the estimated expenditure for the coming financial year is £825,000 more than in the previous year, or considerably less than originally contemplated.

Most of the increase, Capt. von Pustau remarks, is required for the 159 officers and 3264 men added to the personnel of the navy, which will now number 60,580.

The High Seas fleet will consist of 17 battleships and two reserve battleships, four large and six small cruisers, and torpedo-boats.

Foreign stations are occupied as follows: Eastern Asia: Two large and three small cruisers, four gun-boats, two torpedo-boats, and three river gun-boats. Australia, West Africa, and East Africa: Each two small cruisers. America: One small cruiser.

First instalments are demanded in the new estimates for three battleships, namely, the *Ersatz Kurfürst Friedrich Wilhelm*, *Weissenburg*, and *S*. When the last-named vessel is ready the German Navy will consist numerically of the 38 battleships provided for in the Navy Acts, but, as Capt. von Pustau remarks, among these 38 vessels are the absolutely antiquated *Brandenburg* and *Wörth*, and five ships of the *Kaiser* class are included. The first instalment is also demanded for one large cruiser, which, when ready, will nominally complete this class. Capt. von Pustau remarks, however, that among the twenty vessels of this class are included vessels so inferior from the fighting point of view as the *Kaiserin Augusta* and five training ships of the *Hertha* class.—*Naval and Military Record.*

The naval estimates for 1911 include $375,000 for target practice (an increase of $50,000 over 1910) and $150,000 for ordnance experiments.

In a short survey of the past year, *Ueberall* remarks that the technical advances and the lessons of the Russo-Japanese War have been closely observed with reference to the armament and fitting of the new German ships. "Whether a heavier—as a 12-inch—gun will be introduced has not yet been decided; the medium armament will be retained." The new ships have turbines, with which engines excellent results have been attained, and the small cruiser *Emden* has been as successful as the *Von der Tann*. At Wilhelmshaven an important turbine shop is to be built. Trials with motor

ıgines for the navy are in progress. The harbor, fortress, and protecti orks at Helgoland are making progress. The new naval school at Mü ik and the high school at Tsingtau have been opened. The last vessel c ıe navy carrying the old masts and yards, the *Nixe,* went out of commis on in May.

PERSONNEL.—If the ship-building program embodied in the German Nav ıtimates brought no surprises, being merely the execution of the progra ·ovided by the Navy Law, there is no reason to be surprised by the i ·eases which are being made in the *personnel.* It was a great merit of th avy Law that it prescribed an expansion in the number of officers a en in correspondence with the increase of the fleet. Everything is strict ·dered and methodical. The additions to be made in the course of th ːar are 1 vice-admiral, 4 captains, 2 commanders, 8 corvette captains, ıptain-lieutenants, and 56 lieutenants and sub-lieutenants. To the en ːer branch 20 officers of various ranks are intended to be added. Unfo ınately, there is a decline in the eagerness to enter this branch of t ·rvice, which is generally attributed to the widening social breach betwe .e executive and engineer branches of the German Navy. Promotion a ·ospects in the navy are now good, and wealthy and noble families ar ·nding their sons into the service instead of into the army, with unfort ıte results for the engineers. There are additions (13) to the medic ·anch. The men of the lower deck are being increased by 2910, includi ;4 higher ratings, and the seamen-gunners are being increased by 264.— *rmy and Navy Gazette.*

TORPEDOES AND TORPEDO NETS.—The Marine Office, after much expe ent and hesitation, has commenced to equip all battleships and lar ·uisers with torpedo nets. For many years German technicians we ›posed to net defence for reasons that have never been fully ventilate hey pinned their faith to a clever invention of the net-cutting type, hich six varieties exist in Germany alone, but the great advantages co rred by the net have finally won the day. An improved torpedo is a ıder consideration. The largest torpedo now used in the German N ıs a diameter of 19½ inches, and a maximum range of 4200 yards, t stance being run at a speed of 21 knots, so that the weapon does ›mpare so very unfavorably with the British 21-inch model, but the n erman torpedo, according to report, will be much more speedy ›werful. The diameter approximates 22 inches, and the charge is ab ›o pounds, whilst the maximum range is given as over 5000 yards. A e destroyers to be built this year will, I understand, be armed with t ːw torpedo, though this is not yet confirmed, and the torpedo armame the new battleships will doubtless show the same improvement. It ma ·re be remarked that the submerged training tubes experimentally intro ıced some years ago are about to be replaced by fixed tubes, as the first- med have proved impracticable and more expensive.—*Naval and Militar ːcord.*

WARSHIPS IN GERMAN HARBORS.—*Treatment of Foreign Vessels.*—The llowing is a translation of the revised regulations on the above subje pearing in the *Marine Verordnungsblatt:*

1. Warships and war vessels of foreign powers need no special permis ›n to enter fortified and unfortified German harbors and river mouth to navigate on inland waters. Suitable notice should, however, be give such visits through diplomatic channels.

Without this, foreign warships and war vessels, with the exception o ː cases given in section 2, may neither cross the extreme line of fortifica- n, nor remain in the roadstead nor in the harbor respectively in rive

mouths and inland waters. For use of the Kaiser Wilhelm Canal see section 3.

The number of warships and war vessels of the same foreign nation allowed to remain at the same time in a fortified or unfortified harbor is, as a rule, limited to three. Exceptions require permission obtained through diplomatic channels.

2. The above regulations do not apply—(a) to ships and vessels having on board Sovereigns, members of the Sovereign's family, Presidents of Republics or their suites, or Ambassadors or Envoys to the Court of H. I. M. the Emperor; (b) to ships and vessels which are obliged by perils of the sea or damage to run into a German harbor, etc.

3. Permission should previously be applied for through diplomatic channels for foreign warships and war vessels to pass through the Kaiser Wilhelm Canal.

4. In fortified or garrisoned harbors, not the headquarters of a Naval Commander-in-Chief of a station, the chief pilot (Lotsenkommandeur) or harbormaster shall without delay acquaint the commandant (senior officer of the garrison) of the approach and entry of a foreign warship or war vessel.

Commandants (senior officers of garrisons) shall immediately inform by telegraph the General Commanding, the Naval Commander-in-Chief of the North Sea or Baltic station, the Admiral Staff of the Navy and the Reichs-Marineamt, of the arrival of foreign warships or war vessels.

In Kiel and Wilhelmshaven the two last-named authorities will be informed through the Commander-in-Chief of the station.

In ports not garrisoned the police authorities are to acquaint the authorities mentioned in paragraph 3 of this section of the arrival of foreign warships or war vessels.—*Naval and Military Record.*

The Budget Committee of the Reichstag has passed the extraordinary navy estimates for new vessels without debate. The chairman pointed out that with the laying down of the ironclads and the big cruiser *K* all the vessels composing increase in the navy included in the enactment fixing the Government naval program were now in hand.—*Reuter.*

NORTH SEA STRATEGY.—German service journals profess surprise that so much exception should have been taken in England to the article on the North Sea and its strategical character, which appeared in the January *Marine Rundschau.* The *Deutsche Tageszeitung,* after printing copious extracts from the article, and insisting on its technical and scientific character, attacks *The Naval and Military Record* for having presumed to express regret at its publication. However much opinions may differ as to the tendencious nature of the *Rundschau* article, the fact remains that its appearance seems to have been the signal for a perfect deluge of other articles, all of which seek to drive home with sledge-hammer force the points advanced by the Admiralty organ. Journals of high repute, which have hitherto displayed some moderation and tact in discussing the Anglo-German question, have thrown in their lot unreservedly with the extremists. It will surprise people who know the standing of the journal to learn that the *Frankfurter Zeitung* gives prominence to a lengthy discussion by Lieut.-Col. Rogalla von Biberstein of the ease with which the Baltic Sea could be held against English *Dreadnoughts.* This writer believes that England would commence a campaign against Germany by seizing some point on the Danish coast as a point d'appui, and he therefore sounds a note of warning to Denmark. The *Rundschau* article, it will be recalled, credited England with the same intention of exploiting neutral nations in case of war.—*Naval and Military Record.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Colossus	20,250	Scotts (Greenock).	Under trial.
Hercules	20,250	Palmer's (Jarrow).	" "
Orion	22,500	Portsmouth.	Launched Aug. 20
Monarch	22,500	Armstrong.	Building.
Conqueror	22,500	Beardmore.	"
Thunderer	22,500	London (Thames Iron Works).	Launched Feb. 1,
Ajax	23,500	Scotts (Greenock).	Building.
Audacious	23,500	Cammell, Laird & Co.	"
Centurion	23,500	Devonport.	"
King George V	23,500	Portsmouth	"
Armored Cruisers.			
Lion	26,350	Devonport.	Launched Aug. 6,
Princess Royal	26,350	Vickers.	Building.
Australia	18,800	Brown & Co.	"
New Zealand	18,800	Fairfield.	"
	26,850	Palmer (Jarrow).	"
Cruisers.			
Blonde	3,400	Pembroke.	Under trial.
Active	3,400	"	Building.
Amphion	3,400	"	"
Dartmouth	5,250	Vickers.	"
Falmouth	5,250	Beardmore.	Launched Sept. 2
Weymouth	5,250	Armstrong.	" Nov. 1
Yarmouth	5,250	London & Glasgow Co.	Building.
Southampton	5,250	Brown & Co.	"
Dublin	5,250	Beardmore.	"
Sydney	5,250	London & Glasgow Co.	"
Chatham	5,250	Chatham.	"
Melbourne	5,250	Cammell, Laird & Co.	"

NEW CONSTRUCTIONS.—The Admiralty have placed the contract battleship-cruiser included in this year's navy program with the P Iron and Shipbuilding Company, of Jarrow-on-Tyne, and the turbi chinery will be manufactured by the Wallsend Slipway and Engi Company. This cruiser belongs to the same class as the *Lion* a *Princess Royal.* The arrangement of this contract completes the orders for the ships of the program for the current financial year, may be interesting to give a complete record of the builders of hu engines of this large fleet of new vessels. The battleships will be im *Orions.* In the table appended the two cruisers and three torpe destroyers for the Australian fleet are each marked with an asteris

Battleships:	*Builders.*	*Engineers.*
King George V	Portsmouth Dockyard	Parsons Compan
Centurion	Devonport Dockyard	Hawthorn, Leslie Newcastle
Ajax	Scotts Company, Ltd., Greenock	Scotts Company, Greenock
Audacious	Cammell Laird & Co., Ltd., Birkenhead	Cammell Laird Ltd.
Battleship-Cruiser:		
—	Palmers Company, Ltd., Jarrow	Wallsend Slipw Engineering C Wallsend

Unarmored Cruisers:		
Chatham	Chatham Dockyard	Thames Iron Works, London
Dublin	W. Beardmore & Co., Ltd., Dalmuir	Beardmore, Dalmuir
Southampton	J. Brown & Co., Ltd., Clydebank	Brown, Clydebank
Sydney*	London and Glasgow Company, Glasgow	L. & G. Company, Glasgow
Melbourne*	Cammell Laird & Co...	Cammell Laird & Co.
Amphion	Pembroke Dockyard ...	Hawthorn, Leslie & Co., Ltd.
—	Pembroke Dockyard ...	Hawthorn, Leslie & Co., Ltd.
Torpedo-Boat Detsroyers:		
Three	J. Brown & Co., Ltd., Clydebank	J. Brown, Clydebank
Two	J. S. White & Co., Ltd., Cowes	White, Cowes
Two	Cammell Laird & Co., Ltd., Birkenhead	Cammell Laird & Co.
Two	Hawthorn, Leslie & Co., Newcastle	Hawthorn, Leslie & Co.
Two	W. Denny & Bros., Dumbarton	Denny & Co., Dumbarton
One	Vickers Co., Barrow-in-Furness	Vickers Co.
One	W. Beardmore & Co., Ltd., Dalmuir	W. Beardmore & Co.
One	Swan, Hunter & Wigham Richardson, Ltd., Wallsend	Wallsend Co., Wallsend
Two†	W. Denny & Bros., Dumbarton	Parsons Co., Wallsend
Two†	J. L. Thornycroft & Co., Ltd., Southampton	Thornycroft
Two†	Yarrow & Co., Ltd., Glasgow	Yarrow
Three*	Yarrow & Co., Ltd., Glasgow	Yarrow
Submarine Boats:		
Two	Chatham Dockyard	Chatham Dockyard
Five	Vickers Co., Barrow-in-Furness	Vickers Co.
Submarine Depot Ship..	Scotts' Company, Greenock	Scotts' Company
Two Submarine Tenders	Cammell Laird	Cammell Laird
Salvage and Tank Vessel	Vickers Company, Barrow	Vickers Co.
Coastguard Cruiser	Hall, Russell & Co., Aberdeen	Hall, Russell & Co.
Floating Dock	Cammell Laird & Co., Ltd.	—
Floating Dock	Swan, Hunter & Wigham Richardson	—

The fourteen destroyers first enumerated are all of the same design, by Sir Philip Watts; this also applies to the three vessels for the Colonies; but the other six, and marked with a † in our list, ordered in pairs, from Parsons, Thornycroft & Yarrow, are of special design, with alternative systems of machinery, which will invest their trials with great importance. —*Engineering.*

THE KING GEORGE V CLASS.—In continuance of the policy which has been observed for some years, no particulars of the *Centurion* and her three sister ships will be made known officially. It may, however, be stated that they will approximately have a length of 564 feet between perpendiculars (600 feet over all), and a beam of 89 feet, on a displacement of between 23,000 and 24,000 tons. The main armament of ten 13.5-inch guns will correspond with that of the four *Orions*, of 22,500 tons displacement, now building, the guns being disposed along the center line. This arrangement will give a bow and stern fire of four guns, and a broadside of ten. The caliber of the auxiliary armament is doubtful, but it is understood that the design provides for a new system of grouping, and also for the secondary gun positions to be well protected with armor. The torpedo tubes will be of the new 21-inch diameter, and the ships will have an exceptionally powerful searchlight equipment.

The vessels will have a stern walk, and their construction will mark a return to the very old custom in the British Navy of placing the officers' quarters in the after part of the ship. So far as modern ships are concerned, at any rate, the original *Dreadnought* was the first vessel in which the officers' quarters were located forward. The innovation was never popular, and apparently it has not been justified by experience.

On 23,500 tons the *King George V* class will be 5600 tons bigger than the *Dreadnought*. How consistent the advance in size of our *Dreadnoughts* has been is shown in the following table:

Program.	Ship.	Length (feet).	Beam (feet).	Tonnage.	Horse-power.
1905	Dreadnought	490	82	17,900	23,000
1906	Bellerophon	490	82	18,600	23,000
1907	St. Vincent	500	84	19,250	24,500
1908	Neptune	510	85	19,900	25,000
1909	Orion	545	88½	22,680	27,000
1910	King George V...	560	89-90	23,500	31,000

The *Neptune*, which was built very economically cost £86 8s. for each of her 19,900 tons. If the *King George* is built as cheaply, ton for ton, the bill will make a noticeable hole in the third million, for this tonnage rate works out to £2,039,800 for the ship.—*Naval and Military Record.*

The secondary armament of the *King George V* class will consist of twenty 4-inch guns, which, it is understood, will be mounted on the main deck behind armor. This was one of the most severely criticised features of the U. S. *Delaware-North Dakota* class, and it is interesting to see the British and other naval powers now adopting it.

The placing of the contract for the new armored cruiser of the *Lion* class with Palmers Shipbuilding Company, of Jarrow, and the announcement that she is to be fitted with turbines seem to dispose finally of the statement that one of the new capital ships provided for in the last navy estimates is to have internal combustion engines driven by petrol.

The new cruiser will have an over-all length of 725 feet and an extreme

beam of 87 feet. It is expected that she will attain a speed of 28 knots, developing 75,000 horse-power, as compared with 70,000 horse-power of the *Lion*, and that she will be called *Queen Mary*.

ANTI-TORPEDO ARMAMENTS.—We are very glad to see it announced that the Admiralty intend to place the guns carried by our battleships and cruisers to beat off the attack of surface and submarine torpedo craft, behind armor. A commanding position has generally been given to the light guns used against torpedo craft, and in recent years the shields intended at one time for the protection of the guns' crews against machine-gun fire have been stripped off and cast on the scrap-heap as useless lumber, since these light guns were never manned in a ship prepared for battle and the torpedo craft do not hit back and disclose their whereabouts by gun fire when they are rushing in to attack. But what is needed in these days of destructive shell fire from the larger nature of an enemy's gun is some protection from the fragments of explosive projectiles which wreck everything that is exposed in the vicinity of their point of explosion. Our rivals have for a long time been placing armor around the positions in which their anti-torpedo guns are mounted, and have thus afforded them the needful protection to their bores and mechanism. This plan is now to be followed in the ships being laid down at our shipbuilding yards. The same size of gun will be mounted, but they will be brought nearer the water-line, which is a sacrifice in so far as they will lose their old "command," but the sacrifice is called for to gain other advantages and must be made.—*United Service Gazette*.

THE NEPTUNE.—The *Neptune*, the largest battleship afloat in European waters, has been commissioned at Portsmouth, Captain C. M. de Bartolome hoisting his pennant. She is the eighth battleship of the *Dreadnought* class to pass into the service. She has a displacement of 19,900 tons, is 510 feet long, and 85 feet in the beam. She was laid down at Portsmouth on January 19, 1909, under the 1908-9 naval program, and has therefore taken a week less than two years to build. She carries an armament of ten 12-inch 50-caliber guns, sixteen 4-inch 31-pounder quickfirers for defence against hostile torpedo craft, and three 21-inch torpedo-tubes of the new type. In the arrangement of her principal guns the *Neptune* differs from all previous British *Dreadnoughts*. Instead of being abreast, her two beam turrets are disposed *en échelon*, which enables both of them to fire on either broadside. Astern there is another change, for instead of both turrets (on the center-line) being on the same level, the one further from the stern is raised, so that its guns fire over the aftermost turret.

She will, in April next, replace the *Dreadnought* as flagship of the home fleet, and in the interval will carry out a number of experimental cruises, and, it is anticipated, pay a visit to the Mediterranean, as did the first *Dreadnought*. The *Neptune's* crew is composed of the nucleus crew of the battleship *Illustrious*, and of ratings drawn from naval barracks, each of whom marched aboard on the morning of the commissioning of the vessel. The turbine engines of 25,000 horse-power with which the *Neptune* is equipped, are the work of Messrs. Harland and Wolff, the famous Belfast shipbuilders and engineers. The *Neptune* is the first *Dreadnought* to be equipped with the new 21-inch torpedo, the compressed air actuating which is heated, and which gives an initial speed of 40 knots, and an effective range of seven miles, compared with the four-mile range of the 18-inch torpedo. She has been completed at a cost considerably below the estimated achievement—of which fact the Portsmouth dockyard authorities are naturally very proud—and also completed within the stipulated two years with scarcely any overtime.

Taken in conjunction with her more effective guns, the *Neptune* is considerably more powerful than the *Dreadnought*, as the following table will show:

	Ahead.	Astern.	Broadside.
12-inch guns:			
Dreadnought	6	6	6
Neptune	6	8	10
Muzzle energy (foot tons):			
Dreadnought	286,200	286,200	381,600
Neptune	320,400	427,200	534,600

Carrying the comparison still further, the following tabulated statement is, to say the least of it, instructive:

	Dreadnought.	Neptune.
Length over all	526 ft.	546 ft.
Breadth (extreme) ..	82 ft.	85 ft.
Draft (mean)	26½ ft.	27 ft.
Displacement	17,900	19,900
Designed shaft h. p. ..	23,500	25,000
Designed speed	21 knots.	21 knots.
Armor belt	11 in.	12 in.
Armament (main) ...	10 12-in. (45c.)	10 12-in. (50c.)
	24 12-pdr.	16 4-in.
Torpedo tubes	3 18-in.	3 21-in.
Broadside fire	6,800 lbs.	8,500 lbs.
Cost (total)	£1,813,100	£1,728,429
Cost (per ton)	£101.2	£86.8

It may be pointed out that in our later ships, such as the *Orion* and the *Lion*, all the turrets are being placed on the center-line; so that, while the full armament remains available for broadside fighting, the number (compared with the *Neptune*), bearing ahead, is reduced from six to four and astern from eight to four. It is the difference in the broadside fire that marks such a distinct increase in the *Neptune's* offensive qualities compared with the other types of the all-big-gun ship. In the matter of the projectile, too, although the weight of that fired by the *Dreadnought's* guns is the same as that of the *Neptune*, yet the muzzle velocity and consequent striking power of the 50-caliber gun of the latter is considerably of greater energy than the 45-caliber gun of the latter. Not only this, but the main-armor belt is strengthened and made heavier, corresponding with the increase in gun-power and adding greater resisting-power to an enemy's guns.—*United Service Gazette.*

THE "INDEFATIGABLE."—The *Indefatigable*, the fourth British armored cruiser of *Invincible* type, was commissioned on February 24. The date of the *Indefatigable's* commissioning was also that on which Rear-Admiral the Hon. Stanley Colville completed his time in command of the First Cruiser squadron, and was succeeded by Rear-Admiral Lewis Bayly, from the command of the Royal Naval War College. This officer will have under his command four "battle cruisers" of the all-big-gun type, in addition to the *Defence*, of the *Minotaur* class, which, it is announced, will be recommissioned on February 14, for further service in the First Cruiser squadron. Rear-Admiral Lewis Bayly will, therefore, be at the head of the most powerful cruiser squadron in the world, the tonnage and gun-power embodied in his command being as follows:

	Displacement. (Tons).	Best known speed. (Knots).	Main armament.
Invincible	17,250	28.6	8 12-in.
Inflexible	17,250	28.4	8 12-in.
Indomitable	17,250	28.7	8 12-in.
Indefatigable	18,750	...	8 12-in.
Defence	14,600	23.4	4 9.2-in. 10 7.5-in.

In addition, the *I's* carry sixteen 4-in. quick-firing and five machine guns, and the *Defence* has sixteen 3-inch quick-firing and five machine guns. All the vessels are also fitted with five torpedo-tubes except the *Indefatigable*, which has only two. The *Indefatigable* on her recent speed trials developed about 28 knots per hour.

The *Indefatigable* is the first British ship of *Dreadnought* or *Invincible* type, whose torpedo defence guns are not carried on the upper deck or on the turret tops.—*Naval and Military Record.*

THE THUNDERER.—The battleship *Thunderer*, which was launched on [illegible] 1, from the yard of the Thames Ironworks Company, is the twelfth British battleship of the *Dreadnought* type to enter the water. The *Thunderer*, however, resembles the *Dreadnought* in nothing save speed and the single-caliber main armament. In other respects the vessel about to be launched will be nearly 5000 tons heavier than the *Dreadnought*, as well as 58 feet longer; her guns will be 13.5-inch caliber, as against 12-inch, firing a shell of 1250 pounds, compared with one of 850 pounds. The five turrets containing two guns apiece will be more effectively arranged for broadside fighting, so that the *Thunderer* will have ten guns bearing on the beam compared with the *Dreadnought's* eight. The *Dreadnought*, again, had 11 inches of Krupp steel on her water-line; the *Thunderer* will have [illegible] inches of Simpson steel. The launching weight of the hull is estimated at [illegible] tons.

When completed the *Thunderer* will be 560 feet over all, and will have a displacement of 22,680 tons on a draft of 27.5 feet. Her horse-power will be [illegible], and the approximate cost of the ship will be £1,800,000. She will carry 4000 tons of armor, against the 3000 of the first ship of the type. Her secondary armament consists of sixteen 4-inch guns and two 21-inch submerged torpedo tubes according to some accounts; of twenty 4-inch guns and three torpedo tubes, according to others.

The first ship named *Thunderer*, a 74, on July 17, 1761, overtook the French *Achille*, 64, and commenced an action. Presently one of the [illegible]'s guns burst, blowing up part of the poop, causing many casualties, and setting fire to the vessel. However, the British extinguished the flames, continued the fight, and captured the *Achille*. The loss of the victors was heavy, 17 men being killed, 113 officers and men wounded. The *Thunderer* was in the fleet engagement with *d'Orvilliers* off Ushant on [illegible] 27, 1778. She was lost in a West India hurricane in October, 1780.

The next ship of the name, also a 74, was built on the Thames, and put afloat in 1783; length on gun deck, 170 feet 8 inches; tonnage measurement, [illegible]. She was with Lord Howe's fleet at the victory of June 1, 1794. In [illegible], 1795, she took the brig *Eveille* off the French coast. In April, [illegible], being on the Jamaica station, she, with another 74, drove ashore the French frigate *Hermione*, 36 guns, which, being set on fire by her own people, blew up. Under Capt. William Lechmere, the *Thunderer* was with Sir Robert Calder when he defeated Villeneuve on July 22, 1805. On that

occasion she had seven men killed and eleven wounded. At Trafalgar she was not able to commence action until late in the day; her casualties were four killed, twelve wounded. On February 19, 1807, she went up the Dardanelles with Vice-Admiral Sir John Duckworth to threaten Constantinople. When returning down that channel on March 3, she was considerably damaged, and had sixteen officers and men killed or hurt. In August of the same year she shared in the expedition to Copenhagen, and on the 23d was sharply engaged with the Danish gun-boats. In 1808 she was in the Mediterranean again.

On September 22, 1831, at Woolwich, was launched another *Thunderer*, 84 guns, 2279 tons measurement. She shared in the attack on St. Jean d'Acre, on November 3, 1840. In 1864 she was appropriated as a "target" ship at Portsmouth, and subsequently received the name of *Nettle*, and survived until 1900.

Our fourth *Thunderer* was launched at Pembroke on March 25, 1872, at that time a most powerful ironclad with two turrets, each of which contained two 700-pounder R. M. L. guns. Her armor extended from stem to stern at the water line, and amidships was a foot thick. While on steam trials off Portsmouth, on July 14, 1876, one of her boilers burst, causing 45 deaths, including those who died in hospital. Having been completed, she went to the Mediterranean, and, on January 2, 1879, in the Sea of Marmora, one of her big guns burst, killing seven men and injuring nearly 40, some of whom did not recover. This *Thunderer* did some years' service in the "Great Sea." Subsequently she was rearmed with 10-inch 29-ton B. L. guns, and became port guardship at Pembroke. She continued as such until near the end of the century, and was sold on July 13, 1909, for £19,500.—*Naval and Military Record.*

THE "CAMELEON."—The arrival of the ocean-going destroyer *Cameleon* at Devonport has created considerable interest, this being the first vessel of the *Acorn* type to be delivered at the Western port. The *Cameleon*, which was built and equipped by the Fairfield Company, of Glasgow, although of somewhat less displacement and general dimensions than the *Viking* and *Beagle* classes, belongs to a group which in gun and torpedo armament and general equipment are a great improvement on those classes. In the *Cameleon* a second 4-inch gun takes the place of the 12-pounder mounted on the quarter deck of the *Beagle* class, and as compared with the *Viking* and her sisters, which only carry two 4-inch, the addition of two 12-pounders placed well forward for chasing will greatly increase the efficiency of the *Cameleon* and her 19 sister boats. The new vessel also carries the 21-inch long range torpedo as compared with the 18-inch tube in the *Viking* class.

The *Cameleon* is oil-driven, and her designed speed of 29 knots was exceeded on trial, the speed being a compromise between the 27 knots of the *Beagle* and the 33 knots average of the *Viking* class. Her complement is 72. She has two search-lights, one mounted on the fore bridge and the other on a raised platform on the fore side of the quarter deck. The 21-inch torpedo tubes are well clear of the upper deck and can be traversed freely and brought to bear on either broadside.

The 4-inch guns are on the latest pattern pedestal mountings, which have the recoil considerably reduced, thus conducing to increased rapidity of fire with consequent improved accuracy. Electricity is installed throughout the ship, and the living quarters are fitted with every consideration for the comfort of both the officers and men.

The following comparative table shows the development which has been made in recent classes of destroyers:

	Cameleon. 1910.	Savage. 1910.	Viking. 1909.
Class	Acorn	Beagle	Amazon
Length	240 feet	264 feet	280 feet
Beam	25¼ feet	28 feet	27.3 feet
Draft	7.9 feet	9.5 feet	8.7 feet
Displacement	780 tons	880 tons	1,000 tons
I.H.P.	13,000	12,500	15,500
Speed	29 knots	27 knots	33 knots
Armament	2 4-inch	1 4-inch	2 4-inch
Guns	2 12-pr.	3 12-pr.	......
Torpedoes	2 21-inch	2 21-inch	2 18-inch
Fuel carried	160 oil	160 oil	160 oil
Complement	72	76	71

—*Naval and Military Record.*

THE TRAINING OF NAVAL CADETS.—Mr. Reginald McKenna, the First Lord of the Admiralty, has issued an interesting communication on the subject of the preparation of candidates for Osborne College, where naval cadets are trained. This communication is a result of the reception by him of a deputation of head-masters of preparatory schools. The view taken by Mr. McKenna must be regarded as a sound one. He deprecates the idea of special preparation classes in schools, and therefore of specialization in education at a very early age. The object is to secure boys who have had a general all-round training rather than boys who have been "crammed" to pass a competitive examination. The test exacted by the Admiralty for entrance is a simple one, wisely exacted in the course of a personal interview with the boy by a committee who seek to judge of the boy's alertness, general knowledge, and attitude towards things in general. The letter by the First Lord of the Admiralty is as follows:

November 23, 1910.

Sir.—In compliance with the promise made to the deputation of members of the Association of Preparatory Schools which I received on November 2, I willingly write to re-state the position taken by the Admiralty with regard to "special preparation" of candidates for Osborne. The Admiralty are strongly opposed to all special preparation. Ever since the new scheme of entry and training came into operation seven years ago, this attitude has been consistently maintained, and there is not the slightest intention of modifying it. On the contrary, the experience gained during these years has only served to confirm the view that any special preparation of candidates for naval cadetships should be discouraged. It is, in fact, discouraged by every means in our power. We prefer that candidates should receive the usual education which preparatory schools give to boys who are about to pass on to public schools. We even deprecate special "navy classes" in preparatory schools. Any parent who removes his boy from a preparatory school of the ordinary type in order to send him to a school which lays itself out to "prepare for the navy" is ill-advised, and is not improving his boy's chances. We find that the great majority, including the most satisfactory cadets, are those who have received the usual education of a preparatory school up to the time of their entry to Osborne. Upwards of 200 preparatory schools send us boys who have received no special preparation whatever.

You are aware that the system of interview by a committee, which has been pursued since the new scheme came into operation, was adopted as a means of escaping the evils of competitive examination, one of which had been the development of cramming establishments giving special preparation. It has been successful in this object, and I believe there is now no serious danger of a recrudescence of the evil. But it cannot be too clearly

understood that anything in the nature of special preparation is, in our opinion, not only unnecessary, but positively prejudicial.

Believe me, yours very truly,
(Signed) REGINALD MCKENNA.

The Admiralty have adopted a new life-saving apparatus which it is claimed will reduce the danger of loss of life to a minimum in accidents to submarines while they are engaged under water. Messrs. Siebe, German & Co., submarine engineers, of Westminster Bridge Road, are the designers of the apparatus, which has also been adopted in the navies of Japan, the United States of America, Austria, and Norway, and is being put on trial by Germany, France, Italy, and Russia. As the only condition in which the submarine would be unable to rise to the surface involved a large and sudden loss of buoyancy due to an inrush of water, the problem was how to render the crew independent of poisonous gases and prevent the men drowning by providing them with means of escape by ascending to the surface of the water. The apparatus designed for that purpose took the form of a helmet, which is made large enough to allow the head free movement within it, and, sloping away to fit the shoulders, is continued into a short jacket of strong waterproof material. In front of the jacket, inside, is a pocket containing a combined purifier and oxygen generator, consisting of two small chambers, formed in one case. These chambers are charged with a patented substance which, when in contact with the water vapor of the breath, gives off pure oxygen gas and forms a caustic alkali. The alkali then takes up the carbonic acid gas of the respired air and forms an alkaline carbonite. In this way the same air, purified and re-oxygenated, is used over and over again. The jacket can be inflated on its wearer reaching the surface, and in this way forms a lifebelt, while on the window of the helmet being opened the enclosed air is permitted to escape. The apparatus can be put on in thirty seconds and without assistance.—*United Service Gazette.*

AUTOMATIC PISTOLS FOR THE NAVY.—Whatever the reasons at present assigned for the non-introduction of an automatic pistol into the senior service, they will, in all probability, be brushed aside, and such a weapon adopted in the course of a year or so. There are so many points in favor of this course, in spite of the natural conservatism of the navy, which has always prevented any headlong rushes in reform. When one remembers what a mountain of prejudice Sir John Fisher had to surmount before he could move a single step in the direction he had set his soul on going, one wonders how he eventually contrived to go so far as he did. Automatic pistols have been on trial recently, and many of the best naval revolver shots speak well of the weapons when once they had become used to them, although the "kick" was at first rather disconcerting. As London has recently learnt to its cost, automatic pistols are common enough on the Continent, and from the best makers they are as reliable as the present service revolver. They are pre-eminently the weapon for a tight corner, and with their present range are suitable for both ship and shore work. Obviously a pistol is a much handier weapon than a rifle on board ship, and although we are told that boarding is a thing of the past, yet the cutlass and revolver are still naval arms—but the men are not drilled with the cutlass except for show purposes. Pistols are carried ashore for field service, and naval men should be armed with the best weapon on the market so long as prices are reasonable. Another series of trials is shortly to take place, and it is to be hoped, if it is found that an efficient automatic weapon is offered, that the navy will adopt it, and carry such a pistol for use either ashore or afloat.—*United Service Gazette.*

THE MISTRESS OF THE SEAS.—If there is one man in the country who i competent to judge naval policy and to estimate the value of imaginativ statements about naval affairs, it is Sir William White, who, as Direct

of Naval Construction, has done more in his time to make the British Navy powerful than any other man. And Sir William White shatters, absolutely, the flimsy fabric that has been built up by Lord Charles Beresford, and other partisan critics. In the December number of the *Ninteenth Century and After* Sir William White shows very plainly that facts flatly contradict the allegations put forward by the critics, that our naval supremacy had been lowered, and proves that the navy has now, in comparison with our nearest rival, as great a margin of superiority as it had in 1905, when the last conservative government went out of office. And Sir William White is no political partisan, for in the course of his article he spares neither Mr. Asquith nor Mr. McKenna in his condemnation of easy assumptions and rash predictions.

Sir William shows that in March, 1906, Germany had 24 capital ships built and building of a total displacement of 290,000 tons; and Great Britain 53 ships of 780,000 tons—a superiority of 29 ships and 506,000 tons. In that year it was universally admitted that we had "an assured position of supremacy." After a similar comparison of ships to the end of March, 1910, Sir William says that "taking grand totals for ships built, building, and to be laid down in 1910-11, the British superiority above Germany was represented at that date by 30 ships and 508,000 tons." Moreover, Sir William White does not believe that Germany wantonly accelerated her shipbuilding program at a critical time in our political history with any sinister object in view. If there was active development it was due, he insists, to an unwise parliamentary paper, which, on the authority of the British Admiralty, informed the House of Commons in 1907 that nine of the twelve German battleships reckoned among effectives of that year were "obsolescent." This had the effect of spurring Germany on to increased effort, but, withal, the British Admiralty, "assailed" as they were "with such virulence," kept their heads and adjusted matters "with a good deal of foresight, enterprise, and good judgment." In April, 1913, Germany cannot have in commission and ready for action more than the thirteen battleships already commenced, "with the four of this year and the four of next year in more or less advanced stages of construction. . . . In April, 1913, the British fleet will have twenty-seven units complete," so that in *Dreadnoughts* alone we have a superiority of more than two to one. On the face of it, therefore, there cannot possibly be a crisis in 1913, as Lord Charles Beresford so fondly predicts.—*United Service Gazette.*

HEALTH OF THE NAVY.—*Continuous Improvement Reported.*—The annual report of the health of the navy has been published as a Blue-book, and shows that last year there was continuous improvement in the general health of the fleet, as compared with the preceding five years. Not only are the case, invaliding, and death ratios for the year under review lower than the average ratios for the last five years, but the average loss of service for each person has again dropped from 10.8 to 9.76 days. The final invaliding ratio also shows a small decrease in comparison with the previous five years' average. The total force in the year 1909, was 112,700, and the total number of cases of disease and injury entered on the sick list was 72,540, which gives a ratio of 643.65 per 1000, a decrease of 75.34 as compared with the average ratio for the preceding five years.

The number of entries per man for disease and injury was: Home station, .76; home fleet, .56; Atlantic fleet, .62; Mediterranean, .61; North America and West Indies, with Fourth Cruiser squadron, .71; China, .71; East Indies, .95; Australia, .61; Cape of Good Hope, .56; and the irregular list, .85. For the total force the average was .64, a decrease of .05 as compared with 1908.

The average number of men sick daily was 3,015.25, giving a ratio of 26.75 per 1000, a decrease of 2.84 in comparison with the previous five years. The total number of days' sickness on board and in hospital was 1,100,568, which represents an average loss of service of 9.76 days for each person,

a decrease of 1.04 in comparison with the average for the preceding five years.

The total number invalided was 2007, which gives a ratio per 1000 of 17.8, a decrease of 4.3 per 1000 in comparison with the average ratio for the preceding five years. The total number of persons finally invalided was 1764. The ratio per 1000 of final invalidings was 15.65, a decrease of .86 per 1000 as compared with the average for the previous five years. Of the 2007 invalids, 1851, giving a ratio of 16.42 per 1000, were for disease, and 156, a ratio of 1.38 per 1000, were for injury.

The total number of deaths was 362, giving a ratio of 3.21 per 1000, a decrease of .54 in comparison with the average ratio for the last five years. Of this number 258, or 2.28 per 1000, were due to disease, and 104, giving a ratio of .92 per 1000, to injury.

Of tuberculosis, 320 cases were recorded, with 209 deaths. Officers furnished 13 cases, viz.: Executive, 5; warrant, 3; engineers, 2; medical, 1; chaplains, 2. The highest ratio per 1000, viz., 6.91, was given by the East Indies, and the lowest, 2.43, by the Atlantic fleet. Cases were returned from every station. Of influenza, 2280 cases were recorded, with four deaths. The home station contributed 639, the home fleet, 1218, the Mediterranean 109, and all the other stations report small numbers, in the case of the East Indies and Cape of Good Hope only eight and five respectively. Ten cases of suicide were recorded.

THE RISK OF INVASION.—Much discussion has arisen in London and Berlin over the publication of "Notes Containing the [British] Admiralty View of the Risk of Invasion" of Great Britain, which, by permission of the British Board of Admiralty, are added as an appendix to the second edition, just issued, of "Compulsory Service," by Gen. Sir Ian Hamilton.

These notes, which are signed "A. K. W.," the initials of Admiral of the Fleet Sir Arthur Knyvet Wilson, were prepared, it is officially stated, for the use of the War Office in a debate which was to have taken place last November in the House of Lords on a motion of Lord Roberts, who raised somewhat of a scare at the time by declaring that the shores of these islands were by no means so invulnerable to foreign invasion as their inhabitants liked to think. The debate never took place owing to the intervention of the general election.

The notes as contained in the appendix are as follows:

"The really serious danger that this country has to guard against in war is not invasion but interruption of our trade and destruction of our merchant shipping.

"The strength of our fleet is determined by what is necessary to protect our trade, and if it is sufficient for that it will be almost necessarily sufficient to prevent invasion, since the same disposition of the ships to a great extent answers both purposes.

"The main object aimed at by our fleet, whether for the defence of commerce or for any other purpose, is to prevent any ship of the enemy from getting to sea far enough to do any mischief before she is brought to action. Any disposition that is even moderately successful in attaining this object will almost certainly be effective in preventing a large fleet of transports, than which nothing is more vulnerable or more difficult to hide, from reaching our shores.

"To realize the difficulty that an enemy would have in bringing such a fleet of transports to our coast and disembarking an army it is necessary to remember that all the ships operating in home waters, whether they are in the North Sea, the Channel or elsewhere, are in wireless communication with the Admiralty and the Commander-in-Chief, so that if a fleet of transports is sighted anywhere by a single cruiser or even by a merchant ship if she is fitted with wireless, every ship which happened to be in a position to intercept the transports would at once get the order to concentrate as necessary for the purpose, whether she was at sea or in harbor.

"It is further necessary to remember that, even supposing that by some extraordinary lucky chance the transports were able to reach our coast without being detected, their presence must be known when they arrive there; and long before half the troops could be landed the transports would be attacked and sunk by submarines which are stationed along the coast for that purpose.

"Besides the submarines there would be always a large force of destroyers, either in the ports along the coast or within wireless call, as in addition to those that may be definitely detailed for coast defence the system of reliefs for those acting oversea will insure a large number being actually in harbor at their respective bases or within call while going to or returning from their stations.

"These destroyers, though not specially stationed with that object, will always form, in conjunction with submarines, a very effective second line of defence in the improbable event of such a second line being required.

"To understand thoroughly the small chance of an invasion from the other side of the North Sea being successful, it is necessary to put oneself in the place of the officer who has to undertake the responsibility of conducting it.

"His first difficulty will be to consider how he is to get his great fleet of transports to sea without any information of it leaking out through neutral nations or otherwise.

"Next, he will consider that somewhere within wireless call we have nearly double the number of battleships and cruisers that he can muster, besides a swarm of destroyers.

"He has probably very vague and unreliable information as to their positions, which are constantly changing.

"His unwieldy fleet will cover many square miles of water, and as all the ships will be obliged to carry lights for mutual safety, they will be visible nearly as far by night as by day. How can he hope to escape discovery?

"Many of his transports will have speeds of not more than ten to twelve knots, so that there will be no hope for escape by flight if he is met by a superior force.

"If he is sighted by any of our destroyers at night they will have little difficulty in avoiding the men of war and torpedoing the transports.

"Is it possible to entice part of our fleet away by any stratagem? Possibly. But even if he succeeds in drawing off half our fleet the other half, in conjunction with destroyers and submarines, would be quite sufficient to sink the greater part of his transports, even if supported by the strongest fleet he could collect. The fleets would engage each other, while the destroyers and submarines torpedoed the transports.

"Finally even if he reached the coast in safety he would see that it was quite impossible to guard his transports against the attacks of submarines while he was landing the troops and that it was quite certain that a superior force would be brought to attack him before the landing could be completed.

"Taking all these facts into consideration, he would probably decide, as the Admiralty has done, that an invasion on even the moderate scale of 70,000 men is practically impossible."—*New York Sun.*

THE INVASION QUESTION.—" So I turn to all of you, my countrymen, and I say, Sleep quietly in your beds. Do not be disturbed by these bogeys of invasion which have been periodically resuscitated by all sorts of leagues." It is doubtful if those who refused to accept the assurance of the most capable naval administrator of our generation when he made this pronouncement at the Guildhall in 1907 will now take warning from the words of our most experienced naval strategist and tactician. Yet the views of Sir Arthur Wilson on this important subject are shown to entirely accord with those of Lord Fisher, and with the conclusions at which,

on two occasions, and after most careful investigation, the Committee Imperial Defence have arrived. Fortunately, those who have used a are using the invasion bogey in order to give support to their pet schem of defence are comparatively few in number, and the nation as a whol whose anxieties were allayed by the First Sea Lord in 1907, will also content to place its fullest confidence in the First Sea Lord of 1911. Sir Arthur Wilson does not know what the navy can do, and how it prepared to do it, it is quite certain that no one else does. The importan of the statement and its peculiar interest rest in its being an enunciati of the views of a seaman of the recognized distinction of Sir Arthur Wi son; the explanation it contains of the policy of defence initiated by Lo Fisher as confirmed and developed by his successor; and its warning wi regard to the future. The act of invading these islands from the Cont nent has three clear divisions—embarkation, passage, and disembarkatio So far as the first and last are concerned, the operations are of a conjoi character, about which the views of both soldiers and seamen should ha due consideration. But the passage of troops oversea is a matter abo which only the naval officer can speak with authority. This being the cas it will be amazing if Sir Arthur Wilson's utterance does not cause a de impression both at home and abroad. In pointing out that an invasion practically impossible, the First Sea Lord assumes not only that we ha command of the sea, but that we have a fleet of battleships and cruise nearly double in number that of the fleet at the disposal of the intendi invader, and in addition a second line of destroyers and submarines de nitely detailed for coast defence. The strength of our fleet, he says, determined by what is necessary to protect our trade, or in other word to keep open and secure from molestation our communications with t oversea Dominions and possessions of the Empire. If it is sufficient f this purpose, it is almost necessarily sufficient to prevent invasion, sin the same disposition of the ships to a great extent answers both purpose It is the object of our fleet to meet and disable or destroy any hosti vessel before she can get far enough from her port to prey upon our tra ers or dislocate our lines of commercial traffic. If it is successful in effec ing this purpose, it will certainly also be able to deal with any large fle of transports intent upon reaching our shores. Sir Arthur Wilson the describes in detail the difficulties which would face an intending invade and incidentally refers to the immense advantages which wireless h given to the superior naval power. He does not believe it possible th such a fleet of transports as would be necessary could cross the interve ing water without discovery, and therefore without avoiding the defendi forces. Finally, he says, that even if the invader reached the coast i safety, it would be quite impossible for him to guard his transports again the attack of submarines while he was landing the troops, and it would b "quite certain that a superior force would be brought to attack him befo the landing could be completed." This is the only reference to land forc in Sir Arthur Wilson's notes, but he evidently contemplates a sufficien of troops in this country, not only easily mobile and otherwise effective, b adequate in numbers to make the enemy come in such force as to simpli the work of the navy.

It is in the warning attached both to the pronouncement of Lord Fish in 1907, and to that of the First Sea Lord three years later, that we find a importance which it is impossible to exaggerate. Lord Fisher prefaced th remarks at the head of this column as follows:

"Our object has been the fighting efficiency of the fleet, the sufficien of the fleet, and its instant readiness for war; and we have got it."

Unless the conditions there formulated had been fulfilled, the First Se Lord of 1907 would not, and could not, have told his countrymen to igno the threat of invasion. Similarly, Sir Arthur Wilson scouts the idea c successful invasion only so long as our fleet is sufficient to carry out i primary duty, the protection of our trade, believing that so long as it i

adequate for this purpose, it will also be able to fulfil that of guarding our shores. He is able to speak as he does because he is assured that the existing naval organization is thoroughly effective for both purposes. That this is the case is due to the provision both of material and *personnel*, and to his plans for the disposition of force which Lord Fisher was making three years ago, and which have now materialized.—*United Service Gazette.*

THE "HYACINTH" ENCOUNTER.—The affair of the *Hyacinth's* landing party, which lost four men killed and ten missing and wounded as the result of a conflict with natives at Debai, in the Persian Gulf, on Christmas Eve, is the most serious that has occurred in the recent history of the measures taken for the suppression of gun-running in that part of the world. The nearest approach to it was in April, 1908, when two men were killed, and others, including Lieut. Baillie-Hamilton, had narrow escapes, during an attempt of the boats of the *Proserpine* to cut out two dhows moored close inshore off Bunji, about forty miles west of Jask, on the Persian seaboard. Important developments, however, have taken place since then, and the activities of the East Indies squadron, and especially of its Persian Gulf division, appear to have administered a decided check to the arms traffic from the free port of Muscat, so much so that the traders are beginning to establish depots at other places on the Arabian side where they had hoped, no doubt, to be less hampered by British interference. This is an important result of the blockade which Rear-Admiral Slade, in coöperation with the Indian authorities, established during the gun-running season. Under the orders of Captain A. T. Hunt, of the *Fox*, the officers and men of the blockading squadron were very successful in the efforts they made to put down the traffic, and besides the dhows that were captured during their passage across the Gulf, on several occasions parties of seamen and marines were landed to search for and destroy stores of fire-arms ashore. The dangerous nature of the work upon which they have been engaged will be recognized afresh by the loss of valuable life in the *Hyacinth.*—*Army and Navy Gazette.*

The first of three tactical exercises in connection with the assembly of the home, Mediterranean, and Atlantic fleets commenced on Jan. 25, off the Spanish coast. The fleets were divided into "Blue" and "Red," the former consisting of the First and Second Battle squadrons and the First and Second Cruiser squadrons of the home fleet, numbering twelve battleships, eight armored and four small cruisers, while "Red" comprised the Mediterranean and Atlantic fleets and their respective cruiser squadrons, numbering ten battleships, six armored, and one small cruiser. The first of the tactical exercises lasted two days, and on their conclusion the home fleet returned to Arosa Bay and the combined Mediterranean and Atlantic fleets to Vigo. On Jan. 30 and 31 the three fleets carried out battle exercises, anchoring Feb. 1 in Ponte Vedra Bay, which anchorage they left on Feb. 2 for further exercises, in which the junior flag officers directed the movements. The operations concluded Feb. 4, when the fleets dispersed from Ponte Vedra. The home fleet will return to Portland, carrying out a full-power steam trial during the passage. The Atlantic fleet will proceed to Gibraltar for preliminary practice for the gunlayers' test, and the Mediterranean fleet will steam to Malta.—*United Service Gazette.*

THE DECLARATION OF LONDON.—The Declaration of London has been shelved. Sir Edward Grey has been prudent enough to bow before the storm of hostile criticism which his White Papers have failed to abate. The strong and emphatic protest of the Commonwealth Government appears to have had as much weight with Sir Edward Grey as the protests of the many Chambers of Commerce of the United Kingdom. Pending the Colonial Conference next summer, the Declaration of London is very properly set aside by H. M. Government, and no attempt will now be made to force the Naval Prize Bill through Parliament. That is how the matter

now stands, and even the warmest supporters of the proposed measure should be able to recognize the prudence of delay. Despite his somewhat intemperate heat, the thanks of the country is due to Mr. T. Gibson Bowles for the part he has taken in this memorable controversy. His book "Sea Law and Sea Power," already examined in our columns, appeared at the critical moment when Sir Edward Grey was on the verge of presenting the Prize Bill to the House of Commons. Possibly the Upper House would have seen fit to reject the bill on the second reading, but that could not be counted upon.

British Chambers of Commerce are fairly unanimous in condemning the Declaration on four important points. These are:

1. The destruction of neutral prizes at sea.
2. The conversion of merchant ships into war cruisers.
3. Certain clauses dealing with unneutral service.
4. The inclusion of foodstuffs under the head of contraband goods.

These clauses and others ought to be threshed out in Parliament before we ratify any fresh treaty. It is ridiculous for the Powers to say that we must accept the Declaration of London as a whole or not at all. There is no justice or reason in such a claim. The proposed treaty has faults, and these have to be expunged. There is no urgent need to make any new treaty with the Continental Powers, and consequently no occasion for hasty action.

As for the Naval Prize Bill itself, the original favor with which the idea of a supreme tribunal at The Hague was received by the English Press has been considerably modified since. In the present state of disagreement as to the rights of neutrals and belligerents it is improbable that any international court would be able to administer prize law to the general satisfaction. Our own naval prize courts have administered the law fairly and impartially, and to the admiration of many foreign jurists. The decisions of Lord Stowell in many difficult cases are quoted in every continental prize court to this day. British representation upon The Hague tribunal ought in any case to be properly guaranteed. It is not guaranteed under the Declaration of London, for many minor States and petty Republics will be as strongly represented on the list of judges as Great Britain with her enormous sea trade. We admit that a supreme international prize court is an ideal towards which the nations should strive in the interests of peace and concord. That the time has come for creating such a tribunal is, however, by no means evident.—*Naval and Military Record.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Dante Alighieri	19,000	Gov't Yard, Castellamare.	Launched Aug. 20, 1910.
Cavour.	22,000	" " Spezia.	Building.
Giulio Cesare	22,000	Ansaldo-Armstrong.	"
Leonardo da Vinci	22,000	Genoa (Odero).	"
Armored Cruisers.			
San Giorgio	9,800	Gov't Yard, Castellamare.	Under trial.
San Marco	9,800	" "	" "
Georgios Averof	9,800	Leghorn (Orlando).	Launched Mar. 12, 1910.
Scouts.			
Quarto	3,400	Venice.	Ordered.
Marsala	3,400	Castellamare.	"
Nino Bixio	3,400	"	"

The budget for 1911-12 amounts to 192,345,000 francs, an increase of 8,600,000 over the preceding year. Of the total, 160,206,000 francs is for strictly naval purposes and the remainder for the merchant marine.

The *Dante Alighieri*, the first of the new type of Italian battleships, which was recently launched, is attracting much interest on account of her arrangements of triple turrets. The ship displaces 19,250 metric tons, and is 510 feet long with 85 feet beam, and a mean draft of 26 feet. The armor is 10 inches thick amidships, tapering to 6 inches forward and 4.7 inches abaft, while the turrets have 10-inch armor, and the conning-tower 12-inch. The main armament consists of twelve 12-inch 47-caliber guns mounted in four triple barbettes on the middle line. The projectiles of these guns weigh 900 pounds. The secondary armament consists of twenty 4.7-inch 50-caliber guns and sixteen 3-inch. The ship will have five searchlights, and there will be for the first time in the Italian Navy, Bullivant torpedo nets. She will have four torpedo tubes, two forward and two aft. Her estimated speed is 21 knots; more is probable.—*The Engineer.*

The *Revista Nautica* says that the *Dante Alighieri* will have a displacement at least 1200 tons in excess of that for which she was designed, the draft being correspondingly increased by 40 centimeters, or about 16 inches. The result, it is stated, will in no way impair the efficiency of the ship. The speed will be reduced by three- or four-tenths of a knot, but this can be spared, as the *Dante Alighieri* will even then be over half a knot faster than the three other ships of the program. The additional submersion of the armor-belt is considered immaterial, as Italian ships as a rule have less armor below the water-line than those of other nations. An expert committee decided that the ship would be a perfectly efficient unit without any alterations in design being made.

The Italian Minister of Marine has issued orders for the building of six destroyers of 700 tons and 12 sea-going torpedo-boats of 300 tons. The destroyers will be named *Impavido, Intrepido, Indomito, Impetuoso, Irrequieto,* and *Insidioso.* Eighteen other torpedo-boats are to be put in hand, and the whole series will be known as *1 P. N.* to *12 P. N.* (Pattison, Naples), *O. S. 13* to *O. S. 24* (Orlando, Sestri Ponente), and *A. S. 25* to *A. S. 30* (Ansaldo, Armstrong). The following submersibles have been put in hand: *Nautilus* and *Nereide* (Venice), *Velella, Fantina, Medusa, Argo Salpa, Zoea,* and *Falea* (Muggiano), and *Giacinto Pullino* and *Galileo Ferraris* (Spezia). According to the *Esercito Italiano,* the first *Dreadnought,* the *Dante Alighieri,* will be completed in October, 1911. The same authority states that the second vessel of the class, *Conte di Cavour,* will be launched next August, within twelve months of the date of laying down, and that the whole four of these vessels will be completed by January, 1913.—*Army and Navy Gazette.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Under trial.
Aki	19,800	Kure.	" "
Kawachi	20,800	Yokosuka.	Launched Oct. 15, 1910.
Settsu	20,800	Kure.	Building.
Armored Cruisers.			
....	27,000	Vickers.	Building.
Protected Cruisers.			
Shikuma	5,000	Sasebo.	Building.
Yahagi	5,000	Nagasaki.	"
Hirado	5,000	Kobe.	"

The armored cruiser *Kurama,* of 14,600 tons, has completed her trials, and, it is reported, will go to England in April for the Coronation ceremonies, accompanied by the *Tone,* under the command of Vice-Admiral Shimamura.

The keel of the armored cruiser under construction by Messrs. Vick Sons & Maxim, for the Japanese government was formally laid at the n construction works, Barrow, on Jan. 17. The vessel will be one of largest of her class afloat, though all official particulars concerning her being withheld by command of the Japanese authorities. Capt. Fujiw acting chief inspector of the Japanese Navy in London, performed ceremony.

The Tokio correspondent of the Press Association says:

The announcement of the placing of an order in England for a battle came as a surprise throughout Japan. Criticism might have been dire at the authorities because of this departure from the policy announced s time ago, by which the government is pledged to build war vessels in Japanese ship-building yards. The premise was made to conciliate taxpayer in some degree. But those who might have complained in Diet are effectively silenced by the official explanation. The Navy Dep ment has issued a statement in which it is set forth that the Navy Dep ment thought it necessary to secure the latest model of battleship and sp men of the art of shipbuilding. The armament of the new vessel is l a profound secret.

The following figures give the expenditure for naval reconstructio the fiscal year 1909-10 and after:

	For Ships. Yen.	Armaments. Yen.	Tot Yer
1909-10	6,400,409	2,289,177	10,687
1910-11	9,182,004	4,507,582	10,689
1911-12	7,831,909	4,107,677	10,939
1912-13	7,440,409	3,849,177	11,289
1913-14	7,758,632	3,330,954	11,089

—*Naval and Military Recor*

The conditions and development of the Japanese Navy are matters interest, not only from a naval, but also from a political point of v From the papers just to hand from Japan we learn that, although decision of the Japanese government to place the construction of an mored cruiser, with a displacement of 27,000 tons, with the firm of Mes Vickers' Sons & Maxim, has caused some discussion, it was arrived after a deliberate consideration of the question of the designs submi and of the present conditions of the Japanese naval arsenals and pri yards, which are now fully occupied with naval construction, as was clared in the official statement. Excluding the new battleship *Aki* (19 tons) and the armored cruiser *Kurama* (14,620 tons), which are practic completed, ten warships, of altogether 66,000 tons, are in the course construction at the four naval arsenals and at the Mitsu Bishi and Ka saki shipyards. The types and names of these warships are as follows

Name.	Displacement. Tons.	Place of Building.
	Battleships.	
Settsu	20,800	Kure Arsenal
Kawachi	20,800	Yokosuka Arsenal
	Cruisers.	
Chikuma	4,950	Sasebo Arsenal
Yahagi	4,950	Mitsu Bishi Yard
Hirado	4,950	Kawasaki Yard
A river gun-boat	250	Sasebo Arsenal
	Destroyers.	
Umikaze	1,150	Maidzuru Arsenal
Unknown	800	" "
"	800	" "
Yamakaze	1,150	Mitsu Bishi Yard

The actual strength of the Japanese Navy at present is shown in the following table:

	Tons.
Battleships (14)	222,234
Time-expired battleship (1)	10,960
First-class cruisers—armored and unarmored, of 8000 tons or upwards (13)	138,052
Second-class cruisers, from 4500 tons upwards (7)	38,052
Third-class cruisers, from 2000 tons upwards (13)	43,713
Destroyers (57)	—
Torpedo-boats (59)	—
Submarines (13)	—

The Japanese at once strike off the effective list the ships which become out of date and inefficient. Some time ago it was announced that the Chinyen was to be struck off, and it is now stated that the same fate will befall the *Iki*. It seems only yesterday that the Chinyen figured upon the scene as one of China's two battleships which were strong enough to hold command of the Eastern seas until their flags were lowered in the battle of the Yellow Sea, and at Weihaiwei. As for the *Iki*, she took her part in the Russo-Japanese War as the *Emperor Nicolai First*, and had previously played a prominent part in Far Eastern waters, for she was the flagship of the Russian Admiral at Chefoo when Viscount Ito Myoji proceeded thither for the ratification of the Shimonoseki treaty. She now goes to the scrap-heap, and her place is taken as a unit of the training squadron by the Fuji, which was one of Japan's first two battleships—the battleships for which the Diet refused to grant money until the Emperor decreed that 10 per cent of all official salaries, beginning with the privy purse, should be devoted for naval purposes during a period of ten years. The ideas of the Japanese have grown much since that time.—*Engineering*.

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I	16,900	St. Petersburg.	Under trial.
Andrei Pervozvannui	16,900	"	" "
Evstafi	12,500	Nicolaiev.	" "
Sevastopol	23,000	St. Petersburg (Baltic Wks.).	Building.
Petropavlovsk	23,000	" "	"
Poltava	23,000	" (Admiralty Yd.).	"
Gangoot	23,000	" " "	"
Armored Cruisers.			
Bayan	7,800	St. Petersburg.	Under trial.
Pallada	7,800	"	" "
Protected Cruiser.			
Otchakoff	6,750	Sevastopol.	Building.

SPAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
España	15,400	Ferrol.	Building.
Alfonso XIII	15,400	"	"
Jaime I	15,400	"	Ordered.

UNITED STATES.

VESSELS BUILDING.

No.	Name. *Battleships.*	Speed. Knots.	Where Building.	% of Completion Dec. 1.	Jan. 1.	Feb. 1.
30	Florida...............	20¾	Navy Yard, New York.	85.7	86.7	89.1
31	Utah.....	20¾	New York Shipbl'g Co.	92.8	94.8	95.6
32	Wyoming............	20½	Wm. Cramp & Sons.	46.3	48.6	51.0
33	Arkansas............	20½	N. Y. Shipbuilding Co.	52.8	55.4	58.1
35	Texas......		N'pt News S. B. Co.	0	0	0

FRENCH OPINION OF THE UNITED STATES BATTLE FLEET.—The prolon sojourn of the United States battle divisions in the Brest and Cherbo roadsteads has called the attention of French naval men to the rise American naval power as well as to the special methods of Ameri naval construction. It is the prevailing opinion that outside the Brit home fleet no European sea force could safely tackle Rear-Admiral Schr der's armada. The *Dreadnoughts* (two *Delawares* and two *Michiga* have been much admired, and are judged much superior, with their agg gate broadside of 36 guns of 305-mm. bore, to the four *Nassaus* of Fatherland, which can only put in line abeam 32 weapons of 280 mm., a similar inferiority depreciates the German *Deutschlands* (broadside 1800 kilos) when compared with the larger *Georgias* and *Louisia* (broadside of 2500 kilos), which have the twofold advantage of volu of fire and of greater penetration. The superior military utilization the displacement in the United States ships is the object of general pra Such vessels, it is remarked, are the production of the wise policy of American Naval Board, which from the first aimed at size and hitt power, and trusted in big guns.

The *Georgias* and *Louisianas* are considered to be, with the British K Edward, which they much resemble in their general conception, the best p *Dreadnought* ships in existence. They carry a heavier armament than of their contemporaries (four 305-mm., eight 203-mm., and twelve 178-152-mm. guns), materially superior to that of a *Patrie* (four 305-mm. eighteen 165-mm.) and of a *Liberté* (four 305- and ten 194-mm.). At same time, many French officers prefer the *Patrie* type to the Ameri *Georgias,* pointing out in support of their contention the higher free-bo (23 feet against 18) of the French 14,900-ton cuirassés, the greater co mand and arc of fire of their artillery, mostly placed in turrets on upper deck, and their superior protection on the waterline, especially the extremities. Unfortunately, there is no escaping from the fact tha vigorous attack is the most effective means of defence, and it is to feared that, should a *Patrie* and a *Georgia* come into conflict, all the go qualities claimed for the Gallic ship would be of little avail against terrific broadside of the (so-called) over-gunned American vessel.—*Na and Military Record.*

In an article on the subject of the American Fleet, *La Vie Mariti* makes the statement that "Outside of the British home fleet, there d not now exist in Europe any naval force capable of successfully oppos Admiral Schroeder's formidable armada. The German High Sea Fl even augmented with all its reserves, would find itself in a state of ma fest inferiority."

LAUNCH OF THE "ARKANSAS."—The United States battleship *Arkan* was successfully launched at the yards of the New York Shipbuild Company, Camden, N. J., Jan. 14.

The *Arkansas* is 562 feet long over all, 554 feet long between perpendi lars, 93 feet 2½ inches breadth on load-water-line, with a mean draft 28 feet 6 inches. The full-load displacement will be 27,243 tons; the n

mal displacement, with two-thirds supply of stores and fuel and full supply of ammunition, 26,000 tons, and the estimated displacement on trial, 26,000 tons. The ship is to be driven by Parsons turbines on a four-shaft arrangement, which it is estimated will develop a total of 28,000 shaft horsepower, giving the vessel a speed of 20½ knots. A bunker capacity of 2500 tons is provided and 400 tons of oil fuel will also be carried. The boilers are of the Babcock & Wilcox watertube type.

The armament of the vessel will consist of twelve 12-inch guns mounted in pairs in turrets on the center line of the vessel, and twenty-one 5-inch rapid-fire guns for defense against torpedo-boat attack. There will also be four 3-pounders, two 1-pounder semi-automatic guns, two 3-inch field pieces and two .30-caliber machine guns. Two 21-inch submerged torpedo tubes complete the armament.

The construction of the *Arkansas* was authorized March 31, 1909, and the contract with the New York Shipbuilding Company was signed Sept. 15, 1909. The keel was laid Jan. 25, 1910, and the ship will be completed May 25, 1912. The contract price of hull and machinery was $4,675,000 (£963,000).—*Iron Age*.

ORDNANCE AND GUNNERY. TORPEDOES.

PROTECTING ANTI-TORPEDO ARMAMENT.—A departure is to be made in British battleships and battleship-cruisers, in regard to mounting the anti-torpedo armament. All the guns mounted for this purpose hitherto, in British battleships, ranging from 4 inches to the light three-pounder in the older ships, have been left unprotected; their shields being considered superfluous and an unnecessary addition to weights carried by the ship. To keep down all superfluous weight has been the object of designers of late years, as it was realized that every ounce of weight saved in unnecessary details gave more flotation, on the same displacement, for such essentials as thicker armor, more (or larger) guns, more coal for a large cruising area without refuelling ship, or more rounds per gun, so that the magazines and shell rooms would not be so soon depleted in action. As torpedo craft did not hit back with guns when making a torpedo attack on large ships, to put anti-torpedo guns behind armored plates, or armored shields, was considered unnecessary laying on of weights, and so this policy was not adopted in British ships. Experience in the Russian-Japanese War, however, showed that the unprotected, or partly protected, anti-torpedo guns were rendered entirely useless by the fragments of exploding shell during a general engagement, and left the ships without proper protection against torpedo craft when they were let in after the general action between the big ships had ceased. It is to guard against such a catastrophe in British ships that the anti-torpedo guns are to be placed behind shell-resisting armor in our future capital ships.—*United Service Gazette*.

THE "NEPTUNE" EXPERIMENT.—The experimental cruise of the British battleship, *Neptune*, which recently hoisted the pennant, at Portsmouth, is being watched with great interest by those interested in naval gunnery matters. Not only has the *Neptune* super-firing turrets and the echelon system of disposing them combined, but she is also fitted with an improved system of laying and firing the guns, which has been engaging the attention of gunnery specialists for a long time past. The idea is to so arrange the hydraulic or electrical power system that works the heavy guns in the turrets in such a way that the whole of these weapons can be laid for the object by an officer in an armored central sighting position, and fired at the proper moment, without any aid from the men in the turrets, who would simply have to carry out the functions of loading, etc., while the system remained undisturbed by the enemy's fire. The system once penetrated, the men behind the gun would have to take up the work of laying

and firing as well as otherwise working the gun, as is done at present and has been done in the past. So that the idea of displacing the man behind the gun, such as some of our contemporaries have been discussing, is absurd on the face of it—at least at present, whatever the future may produce. It is towards the above end that improvements have been introduced into the *Neptune*, and if they come up to expectations there will, in all probability, be further developments along the same lines in our next warship with power-worked guns.—*United Service Gazette.*

As far as can be judged from the published naval estimates, Germany's total yearly expenditure for target practice in the fleet was only about $325,000 in 1910, and will be only about $375,000 this year.

FIRE CONTROL STATIONS IN GERMAN SHIPS.—It has long been rumored that the Germans were making experiments, to which a certain amount of success was attributed, with a system of observation for fire control purposes, intended to replace the elevated and exposed control positions which are now employed. Matters of this kind are necessarily confidential, and the statements which are made with regard to the new system appear to proceed on the lines of the most probable. If a concealed central station is to replace the elevated observing station, it is hardly possible to conceive how this can be accomplished otherwise than by reflection. The periscope of the submarine appears to be the type of such apparatus. The Germans are, perhaps, pre-eminent in optical science, and it is conceivable that they have attained results much in advance of anything yet achieved. Prismatic telescopes and fine adjustments may probably enable measurements to be made with extreme accuracy, and thus may permit fire to be controlled from below the water line. There must, of course, be elevated tubes for such appliances, and it is a question whether they will not be as liable to destruction as the existing stations. If they offer a lesser target they will be much more frail, and perhaps liable to destruction by splinters. On the other hand, it may be possible to multiply such appliances, and the system may be applied even to the navigation of the ship. It is statec that the German new ships will have such appliances, in association wit tubes on the sides of the ships, not much above the water line, giving telescopic view of near objects.—*Army and Navy Gazette.*

SHOOTING IN THE BRITISH NAVY.—We have just received the thr annually published Blue-books. "Result of Test of Gunlayers with Hea Guns," "Result of Test of Gunlayers with Light Quick-firing Guns," a "Result of Gunlayers' Test from Torpedo-boat Destroyers," which sh the records made during 1910 in the British Navy. We have been acc tomed for some years past to refer to these books and to discuss improvement made in the shooting of our sailors. This has not alw been an easy task, since the conditions have been altered from time time, so that comparison from year to year becomes impossible. Thus 1907 a smaller target was introduced, and is still retained, and since dimensions were given of the two targets, it was exceedingly difficult form a conception of the relative excellence of the shooting of, say, years 1906 and 1908. Nevertheless, there was very considerable impro ment, as we showed at the time, though it was hard to form a comparat idea of it. This year again there has been another innovation. Hith if a shot has hit the water before reaching the target it has been regar and counted in the returns as a whole hit. In the 1910 returns it o counts as a half hit. Hence the returns of 1910 are not directly c parable with those of the years immediately preceding it.

A noticeable feature of the 1910 returns regarding the heavy guns is considerably fewer number of rounds fired. There were 117 ships wh fired, and the number of guns or turrets concerned was 1318. This i greater number of guns than in either 1908 or 1909, yet whereas in 19

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d 1910 are as follows:

	1907.	1908.	1909.	1910.
ounds fired	9,538	9,009	9,438	7,209
of hits (direct)	4,073	4,826	5,108	3,520
of ricochets	—	—	—	436
of misses	5,465	4,183	4,330	3,253
age of hits to rounds fired	42.70	53.57	54.12	51.85

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ber of hits (direct)	7,462	6,120	7,157	3,483
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	1907.	1908.	1909.	1910.
h and 10-inch	.40	.56	.63	.70
h	2.01	2.20	1.94	2.01
h	1.58	2.51	2.47	2.61
B. L. and Q. F.	3.32	3.98	4.03	3.69
Q. F. and h B. L. and Q. F.	2.38	3.32	4.06	3.84

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	1907.	1908.	1909.	1910.
r of guns	1,898	1,384	1,407	1,531
r of rounds fired	17,734	12,943	14,276	8,020
r of hits (direct)	7,462	6,120	7,157	3,483
r of ricochets	—	—	—	283
r of misses	10,272	6,823	7,119	4,254
tage of hits to rounds fired	42.08	47.28	50.13	45.19

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As far as can be judged from the published naval estimates, Germany's total yearly expenditure for target practice in the fleet was only about $325,000 in 1910, and will be only about $375,000 this year.

FIRE CONTROL STATIONS IN GERMAN SHIPS.—It has long been rumored that the Germans were making experiments, to which a certain amount of success was attributed, with a system of observation for fire control purposes, intended to replace the elevated and exposed control positions which are now employed. Matters of this kind are necessarily confidential, and the statements which are made with regard to the new system appear to proceed on the lines of the most probable. If a concealed central station is to replace the elevated observing station, it is hardly possible to conceive how this can be accomplished otherwise than by reflection. The periscope of the submarine appears to be the type of such apparatus. The Germans are, perhaps, pre-eminent in optical science, and it is conceivable that they have attained results much in advance of anything yet achieved. Prismatic telescopes and fine adjustments may probably enable measurements to be made with extreme accuracy, and thus may permit fire to be controlled from below the water line. There must, of course, be elevated tubes for such appliances, and it is a question whether they will not be as liable to destruction as the existing stations. If they offer a lesser target, they will be much more frail, and perhaps liable to destruction by splinters. On the other hand, it may be possible to multiply such appliances, and the system may be applied even to the navigation of the ship. It is stated that the German new ships will have such appliances, in association with tubes on the sides of the ships, not much above the water line, giving telescopic view of near objects.—*Army and Navy Gazette.*

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A noticeable feature of the 1910 returns regarding the heavy guns is considerably fewer number of rounds fired. There were 117 ships wh fired, and the number of guns or turrets concerned was 1318. This i greater number of guns than in either 1908 or 1909, yet whereas in

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	1907.	1908.	1909.	1910.
nds fired	9,538	9,009	9,438	7,209
of hits (direct)	4,073	4,826	5,108	3,520
of ricochets	—	—	—	436
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new way of counting ricochets. The figures for the last four years are as follows:

	1907.	1908.	1909.	1910.
12-pounders	4.471	5.319	6.005	5.454
6- and 3-pounders (except Vickers')	3.640	4.507	4.191	3.651
3-pounder (Vickers')	6.140	6.069	7.810	6.127

The returns concerning torpedo-boat destroyers have been entirely remodelled, and the very name of the Blue-book has been changed from "Result of Battle Practice from Torpedo-boat Destroyers" to the title given at the commencement of this article. Hence no comparison is possible with former years. Nevertheless, the information given is of considerable interest. The guns concerned are the 4-inch B. L.; the 12-pounder 12 cwt.; the 12-pounder 8 cwt., and the 6-pounder. There were 175 ships engaged in the test, and they had a total of 736 guns. The total number of rounds fired was 3847, the number of direct hits 1545, of ricochets 171, and of misses 2131, the percentage of hits to rounds fired being 42.38 on the average.

The details of the practice made with the various types of guns are given in the following table:

Nature of gun.	Rounds fired.	Hits.		Misses.	Percentage of hits to rounds fired.
		Direct.	Ricochet.		
4-in B. L.	140	62	5	73	46.0[illegible]
12-pr. 12 cwt. on P.V. and V.I. m't'gs	135	57	9	69	45.5[illegible]
12-pounder 12 cwt. on P. I. mountings	1052	386	51	615	39.12
12-pounder 8 cwt.	461	125	17	319	29.06
6-pounder, with telescopes	1921	878	82	961	47.84
6-pounder, without telescopes	138	37	7	94	29.35

The hits per gun per minute with the 4-inch B. L. gun averaged 3.63, with the 12-pounder 12 cwt. gun 3.88, with the 12-pounder 8 cwt. gun 2.73, and with the 6-pounder 6.43.—*The Engineer.*

GUNNERY IN THE BRITISH NAVY.—It is in no way derogatory to the great ingenuity and experience displayed at the Admiralty and in factories in the design and construction of the *matériel* for the navy to say that the ultimate efficiency of ships, machinery, and ordnance must depend, in Britain's hour of need, upon the officers and men of the fleet. Three branches of the Service are responsible for success in war operations; the tactician on the bridge, the engineer in the turbine-room and stokehold, and the man behind the gun. They are interdependent; should any one fail in the duties of his respective office, the value of the work of the others is depreciated. The almost continuous exercises undertaken by the fleets, by night and by day, give confidence in the view that in respect of tactics our ships will be brought into favorable positions of attack. The absence of machinery failures, notwithstanding the extent of maneuvers now undertaken, and the realization of the maximum speed possible, whenever required, indicate that the engineering branch of the navy is thoroughly efficient. As regards gun-fire it is possible to have direct testimony in the results published annually of "the test of gun-layers." The test conditions have from time to time been increased in severity; yet the gunner rises to the demands made upon him. Thus the speed at which the ships steam past the target has been increased within recent years, and the target has been reduced in area. Now the target, which is towed at an unknown speed, course, and

range, relative to a practicing battleship, is only 90 feet long by 30 feet high—less than one-fifth of the length of a ship of the line, and yet, during 1910, with 10-inch and 12-inch guns, the ships of the fleet attained, on an average, 0.7 hit per minute, against 0.4 four years ago; the 9.2-inch guns, 2.01 hits per minute; the 7.5-inch guns, 2.61 hits, against 1.58; and the smaller guns still higher rapidity.

The details show that 117 ships engaged in tests of guns ranging in bore from 12 inches down to 4 inches, and with an aggregate of 1318 turrets or guns. From these guns 7645 shots were fired in practice, and 3520 of these hit the target, small as it was, while, in the case of 872 rounds more, the shot ricocheted on to the target. Formerly such ricochet shots counted a hit, and on this basis the percentage of hits to the total rounds fired is 54.86 per cent for the past year, against 54.12 per cent in the previous year, 53.57 per cent in 1908, and 42.7 per cent in the year 1907, prior to which the firing conditions were less onerous. Within six or seven years the improved efficiency of the gunner, assisted by great improvements in the sighting mechanism and more satisfactory gun-control systems, has at least doubled the effective utility of every gun on board ship. That there is room for further improvement is suggested by the splendid performance in some individual ships. Thus the *Téméraire*, one of the later battleships, with ten 12-inch 50-caliber guns, fired 37 rounds, and scored 29 direct and 3 ricochet hits, or about 81.91 per cent of hits to rounds, reckoning the ricochet as a half-hit. This equalled 3.35 hits per gun per minute. The *Lord Nelson*, with her four 12-inch guns, returned 3.23 hits per gun per minute and with her 9.2-inch guns, 3.64 hits per minute; but this latter was fewer than with the same gun in other ships. The *Bedford* marks the attainable standard for the 6-inch quick-firing gun. This ship, which has, unfortunately, been lost, takes first place for the year. Firing 62 rounds, she made 39 direct and 9 ricochet hits, equal to 5.46 hits per gun per minute, while the best gunner of the ship got 10.31 hits per minute for his gun. With a 4.7-inch gun a gunner on the *Astrea* got 11 hits per minute. These performances should stimulate other gunners to greater practice and keenness, as the highest performances per gun per minute are far above the average per gun in the case of the best ships' performance with each type of gun; for the 12-inch gun 3.35 hits, against 0.7 hit; for the 9.2-inch, 5.34, against 2.01 hits; for the 7.5-inch, 5.32 hits, against 2.61 hits; for the 6-inch quick-firing gun, 6.08 hits, against 3.69 hits; and for the 4.7-inch or 4-inch, 8.06 hits, against 3.84 hits. The China squadron did best during the year with 56.628 points. Next came the second division of the home fleet with its cruiser squadron with 47.567 points; then the Cape squadron, followed by the other divisions of the home fleet, the Atlantic fleet, the East India, and Mediterranean and Australian squadrons.

As regards the smaller guns—from 12-pounder to 3-pounder—it is shown that the number of hits per 100 rounds is 45.19. In the case of the 12-pounder gun the number of hits per minute—the average for the whole fleet—was 5.454; for Vickers 3-pounder guns, 6.127; and for the other makes of 6-pounder and 3-pounder guns in the Service, 3.651 hits.

The gun practice of the torpedo-boat destroyers is of great importance. Of this type of ship, 175, with 736 guns, engaged in practice, and succeeded in making 42.38 hits per 100 rounds fired. The 4-inch guns with which these vessels are fitted justified their adoption, as they succeeded in getting a percentage of hits to shots fired of 46.07, whereas the 12-pounder, on the later mountings, gave 45.56 per cent, and the 12-pounder on the earlier mountings 39.12 per cent; the 12-pounder 8-cwt. gun, 28.96 per cent; the 6-pounder with telescopes, 47.84 per cent, and without telescope, 29.35 per cent. As regards hits per minute, the 4-inch further justified itself, as its greater striking power, as compared with the other guns on these vessels, has not been purchased at the expense of rapidity, since the difference is inappreciable—3.63 hits per minute for the 4-inch gun; 3.88 for the 12-pounder 12-cwt. gun, and 2.73 for the 12-pounder 8-cwt. gun. The best

results got from any 4-inch gun in destroyers gave 9.43 hits per minute; the 12-pounder 12-cwt. gun, 12.50; and the 6-pounder and 3-pounder with telescopic sights, 18 hits, and without telescopic sights, 12 hits. These figures indicate the possibilities of further improvement, although it must be admitted that, in view of the large number of guns fired in the tests, and the varying conditions as to weather, etc., the average is high, and justified the approval expressed by their Lordships of the Admiralty.—*Engineering.*

FRENCH TARGET PRACTICE.—Considerable discussion has been caused in the French Navy by recent decisions in regard to what are known as the *tirs d'honneur.* Ships which have secured the best results have, by a revision of the awards, been displaced by others. The *Moniteur de la Flotte* says that there is a strong movement, accelerated by this incident, for the suppression of this competitive firing, because the results are falsified by a confusion of rules. The principal object has been to excite healthy emulation, but it is doubtful whether emulation has not suffered by a comparison which is not strictly equitable. Emulation depends mostly upon the officers, and who, asks the *Moniteur,* would think that officers capable of an effort to prepare their men for the competition, would not make a continuous and conscientious effort to prepare their men for actual fighting? Some disadvantages connected with the present system are pointed out. Previous to the year 1910 the results were judged by the number of rounds which reached the mark within a specified time whatever might be the caliber, and no effort was made to elucidate the respective values in relation to the number of rounds fired by the big and medium caliber guns. Too much attention has been paid to rapidity of fire, which could not be maintained in action. Other complications are mentioned, and the conclusion is that the *tirs d'honneur* have gone too far. They must therefore either be suppressed or interrupted until some further experience has been gained of the better conditions required for really effective competitive firing.—*Army and Navy Gazette.*

The remarkable progress the French Navy has recently made in gunnery has created among naval men a regrettable divergence of views as to the principles which must preside over the handling of battle fleets in action. To the contention of ship-commanders of the "vieille école" that battles are won by clever tactical moves and by out-maneuvering the enemy, gunnery officers, headed by Admiral Le Bris, of the "Ecole de Canonnage," judiciously reply that the all-important thing is to paralyze and destroy the enemy by keeping him, from the outset of the action, under a well-sustained and accurate fire, and that for this reason, maneuvering must be made subservient to the utilization of the gun since the latter is obviously the determining factor in sea warfare. The unfortunate thing is that expert gunnery is rather a novelty in the French service, and that many "commandants" do not realize, like their English collègues do, that any maneuvering not having for its object an increase in the number of hits is meaningless, foolish, and a sure sign of incompetence. It is by striking hard, not by clever running, that victories have ever been won.

The question of the armament of the two 1911 battleships, shortly to be ordered, has just been examined by the Conseil Superieur de la Marine. The artillery authorities announced that all preliminary studies and experiments had been completed concerning the 340-mm. gun now in course of construction at the Ruelle factory, and that this new caliber could be fitted in the 1911 ships without entailing much delay, should the Admiralty decide to follow the example of England in discarding the 305-mm. type. Great divergence of views as to the advisability of the latter course was elicited. The partisans of the retention of the 12-inch weapon observed that in the matter of penetration at long range the 45-caliber guns of 305-mm. bore of the *Danton* class answer all present requirements, their e͏co-

pointed shells being capable of piercing 370-mm. Krupp steel at 8000 meters (with an angle of 20° to the normal), and all existing armor belts at a range of some 10,000 meters. In the matter of rate of fire, the heavy guns of the *Dantons* were designed to shoot two rounds per minute, whilst 2.4 shots per minute were expected (with 400 kilo shells) from the improved 12-inch ordnance of the *Courbets*. To discard now so well studied and so efficient a weapon in favor of higher calibers would be to incur needless additional expense and delay, and to sacrifice volume of fire—an essential factor—for the sake of a useless increase in the penetration. It would be a thousand pities, added the staunch supporters of the 12-inch, not to complete a full division of four *Courbets* since this creation of Constructor Lyasse is certainly one of the most remarkable designs of "cuirassés" ever made for the French Navy, and has the merit of being ready in every detail, and if any extra gun power is judged necessary let it be sought in an increase of the armament of 12-inch weapons rather than in the adoption of heavier, more cumbrous, and less handy guns similar to those mounted in the British *Benbow* and *Inflexible* and in the Italian *Lepantos*, which had only an ephemeral existence. To this contention the partisans of progress answered by emphasizing the importance of the first blows, and by pointing out that in a duel between an *Orion* and a *Courbet* the British ship could hit first and with decisive effects, since there was no minimizing the superior destructive power of 600 kilo shells at extreme range. The *Courbets* (Nos. 3 and 4) could be made to carry, without much increase of their present displacement, 10 guns of 340 mm. (or eight of 370 mm.) on the center line. It is understood that no final decision was arrived at.—*Naval and Military Record.*

THE PROGRESS OF WAR MATERIAL IN 1910.—The war material of the great armies is at present in a stage of arrested development. The large orders given in 1909 for guns, rifles, and machine-guns are still in course of completion, and the leading makers are not inclined to favor developments which would render their new material obsolete before it is issued.

Field Artillery.—In the domain of field artillery the only new equipment which has appeared is the Montluçon "scissors trail" gun, invented by Colonel Deport. The gun is a 14.3-pounder, M. V., 1660 f. s., with hydro-pneumatic recoil gear of the ordinary French type. The novelty is confined to the lower carriage, which has a divided trail so constructed that the two halves can be opened out and nailed to the ground. This gives [illegible] degrees of traverse and 75 degrees of elevation, so that the gun can be pointed at any possible target on the ground or in the air without shifting the carriage. This gun has been successfully tried, and its mechanical action seems quite satisfactory; but it is an open question whether the tactical advantages gained are sufficient to compensate for the additional complication. The gun would be nearly useless for firing at balloons without special smoke-trail ammunition, which could not be carried without reducing the number of rounds available for ordinary purposes, and it would appear preferable to rely on special high-velocity guns for engaging balloons and aeroplanes.

The Armstrong 1909 76-mm. field gun, with compressed air running-up gear, has been slightly improved in 1910, and has achieved some very remarkable performances in the way of accurate shooting. This is no doubt due to a great extent to the ammunition, especially the shell, which has an ogive of four calibers. The introduction of these pointed shells, similar to the pointed rifle bullets now used, is only a matter of time. They have not been brought in for existing equipments, as this would require scrapping the present stocks of ammunition and the present limbers and wagons.

The only new field howitzer which has appeared is the American weapon, which is on the variable recoil system. The valves of the buffer piston are controlled so as to give different lengths of recoil at low, medium and

high elevations. This affords a long recoil and steady carriage when the howitzer is fired point blank, while at high elevations the recoil is shortened to prevent the breech from striking the ground.

Mountain and Balloon Guns.—No new mountain gun has been brought out. The Russians have adopted the Schneider-Danglis gun, successfully tried in Greece in 1908. This gun is weighted with a loose jacket to reduce the recoil, and is a 14.3-pounder with M. V. of 1235 f. s. The French have at last completed the issue of the Ducrest mountain gun, which was introduced in 1906. This is a differential recoil gun, which is drawn back to the extreme recoil position before the first round and fired automatically during the run-up. It is hardly sufficiently powerful for modern requirements, being only a 10-pounder with M. V. 1075 f. s.

No great progress has been made in balloon guns, as it still appears doubtful whether dirigible balloons will be used in war on any extensive scale in the immediate future, and makers have received no orders except for a few experimental guns. A 75-mm. balloon gun mounted on a motor car appeared at the French maneuvers, but, this had only a traverse of 90 degrees, and appeared far inferior to the Krupp high-velocity 12-pounder on transportable platform, which still holds its own as the standard weapon. Vickers' Sons & Maxim have a new gun for the armament of dirigibles; this is a 6-pounder, with M. V. 1125 f. s., on pivot mounting with differential recoil gear, weighing 450 pounds complete.

The principal difficulty in the way of the development of the balloon gun is the provision of a fuse sufficiently sensitive to act upon the envelope. Messrs. Krupp have brought out three such fuses (British patents 11,617/09, 23,296/09, and 19,399/10). In these fuses the percussion action is exerted by a previously compressed spring, which is released on impact. The contact pin or trigger is locked by centrifugal bolts, which act in succession, so that it is not freed till the shell has travelled some distance from the muzzle. Thenceforward the contact pin is held in position against the air resistance by friction, which is not due to the close fit of the parts, but to the pressure against it of the segment-shaped centrifugal bolts. The friction can thus be definitely graduated so as just to hold the contact pin against the air resistance. One of these fuses has three triggers formed like the whiskers of a fish torpedo and connected by a serrated ring, which increases the resistance to penetration of the balloon envelope.

Ammunition.—The development of the universal artillery projectile is progressing slowly. The Ehrhardt universal shell has a separate head which forms a small high-explosive shell, while the bullets of the shrapnel portion are packed in trinitrotoluol, intended to explode only when detonated by the percussion fuse on impact. The Krupp universal shell—1910—is much the same as the Ehrhardt in principle; but the burster among the bullets consists of three layers of different grades of high explosive, which are said to render its action more certain.

For ordinary high-explosive shell Schneiders have brought out a safety fulminate fuse containing no less than 55 grains of fulminate, consolidated by heavy pressure. The fulminate is kept cool by a freezing mixture while being pressed. The compressed fulminate is as hard as marble, and is claimed to be absolutely safe.

Heavy projectiles for coast defence and siege guns are now mostly made of "electric" steel, smelted in the Girod electric furnace. Messrs. Krupp have installed five 15-ton furnaces of this type. The Girod process gives homogeneous metal of definite composition, remarkably free from blowholes. Shells of 6-inch caliber and upwards are now fitted with long pointed caps, intended to reduce the air resistance and increase the striking velocity, on the same principle as the pointed rifle bullet.

Machine Guns and Small Arms.—Great activity has been manifest in the manufacture of machine guns, but no new pattern has appeared. The two existing types are the Maxim, with recoiling barrel, and the Hotchkiss, in which the mechanism is actuated by a small portion of the gases admitted

to a power-cylinder at each shot. All others are modifications of one or the other of these types. Numerous forms of radiator have been devised to keep the barrel cool in place of the inconvenient water-jacket. The improvements have been in the direction of providing air passages in the radiators, through which a natural or forced circulation of air is maintained. In other types attempts have been made to combine radiation and water cooling. But a fully satisfactory barrel cooler has yet to be invented. The Austrians have adopted nickel-plated cartridges coated with graphite for their machine gun; these feed smoothly and are not liable to jam.

There are no novelties in small-arms worth recording. The French are experimenting with various patterns of automatic rifle with a view to re-armament. The specification issued by the French government was given in *The Engineer* of March 25, 1910. The Germans are considering the question of increasing the weight of their pointed bullet from 10 grammes to 11 grammes, in order to obtain more accurate shooting at medium ranges. The Mexicans have converted their magazine rifle to the automatic system, and the Swiss have re-armed with a new 2.95-inch magazine rifle, firing a pointed bullet of 175 grains with M. V. 2707 f. s.

Field Wireless Telegraphy.—In field wireless telegraphy, experiments are being made with the object of directing the waves, so that they can be prevented from reaching the enemy. The Bellini-Tosi system of directive wireless has been satisfactorily tried in America. It consists of two partly-closed triangular antennæ in vertical planes at right angles to each other, having at the intersection of their horizontal bases a radio-goniometer, which consists of two fixed coils and a third coil which can be pointed in any direction. This apparatus was found to be capable of directing signals with great accuracy. It has also the advantage of eliminating earth-currents; but the signals are enfeebled by the use of the radio-goniometer, and the effective range is only one-fourth of the normal for the same height of mast. However, it appears that there will be no practical difficulty in carrying a mast sufficiently high to give a fifty-mile radius of action, which is sufficient for ordinary military purposes.

Fortifications.—Land fortifications have been pushed on in most countries on the Continent, especially in Italy and Belgium. The Cockerill armored turrets employed in the Antwerp defences have been described in *The Engineer* of July 29, 1910. The fortifications at the mouths of the Panama Canal have been commenced, but will not be completed till the Canal is opened in 1915. The armament is to include ten 14-inch guns, twenty-eight new 12-inch howitzers, and a number of 6-inch and smaller calibers. The 12-inch howitzer is a formidable weapon, firing a 700-pound shell, with a range of nearly 10 miles.

From a business point of view, trade in land armaments has been unusually dull during 1910, with the sole exception of machine guns, and there is no present prospect of improvement. The money available for war material is being spent on naval armaments.—*The Engineer.*

SAFETY OF THE NAVY.—The following extract from a debate in the House of Lords on June 6, 1810, is perhaps one of the earliest references to the torpedo as an instrument of naval warfare:

"Earl Stanhope rose to submit a motion to their Lordships, which he thought related to a subject of more importance than any set of motions that had been before them for a very considerable time past, as it related to that on which the very existence of the nation depended, the British Navy. He had some years ago called their attention to this subject, on which he should now speak plainly, as a man of science would speak, and not like those who bamboozled people with mysteries, and involved everything in hard words and terms from the schools. He would make every noble Peer understand him. His Lordship then adverted to the experiments tried some years back off the French coast, and since then in

America, by a Mr. Fulton, for the ascertaining of a mischievous a horrid mode of destroying vessels of any size while floating in the wat He went through the history of these terrible inventions, which opera either by a line thrown into the water, which, meeting the ship, gave opportunity to the machine to cling to the vessel, upon which the destr tive explosion of gunpowder took place, which absolutely would cut a vessel in two (the proof of which had been made some years back Walmer Roads); or by the immersion of a machine with a trigger whi when pulled, answered the same purpose; or by throwing an engine the same purpose on a vessel. This person was invited over here, and Lordship had seen an engagement between him and Mr. Pitt and Lc Melville, signed by them, agreeing in certain events to give him £40, and so on, to an immense amount. After the failure of a trial at Boulog his claim was referred to certain scientific umpires, who awarded h £15,000; since that he had made his experiments in America, where bo Jefferson and Madison were present, and had been voted $5000. I Lordship was led, at the present moment particularly, to this moti by a pamphlet he had just received from America containing the partic lars, with plates, illustrative of the nature and effects of the inventi He then entered into a very scientific discussion and exposition of t theory of fluids, and the principles on which the machine acted, and stat that there were means in our power to counteract its dreadful effects, so of which he pointed out. There was also another and more ingenic invention for a more difficult object, namely, the cutting of the cables blockading vessels when lying off a lee shore; what he wanted to know v this: as the subject had been looked on already as so important by gr men, and by men of science, what had been done by government in way of providing a remedy, and to what extent? For the purpose ascertaining this, he had framed a motion, which he read; desiring account of the measures taken to counteract the effects of these submar carcasses and explosions, and of the *torpedo* triggers, &c., &c.

"The question was put, when his Lordship demanded a division, which the numbers were: Non-content, 25; content, 8; majority agai the motion, 17."—*London Times.*

After many experiments and much hesitation, Germany has definit adopted torpedo defence nets for her battleships and armored cruisers.

Messrs. Whitehead & Co. have given out a statement correcting cert published data concerning their new 45-cm. torpedo. They state that t torpedo has speeds of 29, 34 and 40 knots for 3000, 2000 and 1000 met respectively, these speeds being guaranteed in their latest contracts a being actually exceeded. The dispersion is guaranteed not to excee meters at 1000 meters range, 15 meters at 2000 meters range, and 25 met at 3000 meters range.

THE "PURITAN" EXPERIMENT.—The following statement has been m by the United States Naval Bureau of Ordnance concerning the high ex sive test against the *Puritan* on November 25:

1. The test of high explosive charges against the side and turret arm of the *Puritan* was made in accordance with a provision that such attack should be made against an actual ship, and specified both the ch acter of the explosive to be used and the weight of the charges.

2. The explosive was that known as "explosive gelatine," well kn as the most powerful of all the nitro-glycerine compounds used for n tary or blasting purposes, and one of the most sensitive of such c pounds. The charge was in each case 200 pounds, which is believed to the largest charge of this explosive ever detonated.

3. The *Puritan* was selected for the test because, although much wea in resisting power than a modern battleship, she was perfectly avail

and was considered to present more favorable all-round conditions for the test than any other ship which could wisely be used at this time, it being recognized that a test so extreme as this one could not fail to result in damages serious enough to call for repairs which might cover considerable time. The turret armor of the *Puritan* has a thickness of 8 inches, as against 12 and 14 inches in battleships of latest design, and the side armor at the point attacked was 10 inches thick, tapering to five inches at the lower edge of the belt. The *Puritan's* belt armor extends only about 3 feet below the normal water-line, and only 2½ feet below the existing water-line at the time of the test.

2. The explosion against the turret armor set back the plate against which the charge was placed, dishing it considerably and opening a number of deep cracks, some of which probably extend through the plate. The seams between this and adjoining plates were opened as were also those between the next two plates. It is not known whether the turret can be turned, as the test of this point could not be made until certain plates which had been inserted between the turret and the barbette shall have been removed after the return of the ship to the navy yard, but no pipes or joints in the mechanism were disturbed, and there was no evidence inside the turret of any disturbance whatever. Two chickens and a cat, which had been placed in the turret at points where the crew would be stationed for working the guns were entirely uninjured.

3. With regard to this test, it may be said that, as far as is apparent at the present time, the turret was not in any sense vitally damaged.

4. The second charge, against the armor belt, buckled the plate against which the attack was directed, swinging the ends of the plate outward and opening up the seams at the ends. The lower edge of the plate was also pushed outward, opening up a longitudinal seam below water, and starting a bad leak through which the water-tight compartment affected was rapidly flooded. It is impossible to say what damage was done below the armor belt, but there is no indication that this was serious. The narrowness of the armor plate undoubtedly contributed very largely to the result obtained. The wider plates of a battleship's belt would have resisted buckling more effectually, and the longitudinal bulkhead, which exists in all modern ships, would have confined the flooding within narrow limits. As a result of the leaks, which in the *Puritan* gave free access of water to the whole of a large compartment running entirely across the ship, the stern of the ship settled about 12 inches, and at low water seemed to touch bottom, the depth of the water being only one foot in excess of the draft of the ship. With a rising tide the ship floated, showing that the reserve buoyancy of the after compartments was ample for taking care of the leak.

MARINE ENGINEERING.

THE FIRST GAS-DRIVEN CARGO VESSEL.—Arrangements have been made for the launching, on February 16, from the shipbuilding yard of J. T. Eltringham & Co., of South Shields, of the ship *Holzapfel I*, which, upon completion, will rank as the first sea-going gas-driven cargo vessel. *Holzapfel I* is being built for the Holzapfel Marine Power Syndicate, Limited, of London. She is 120 feet long between perpendiculars, 22 feet beam, by 11 feet 6 inches moulded, and is intended to carry a little over 300 tons deadweight on a draft of 10 feet.

A set of high-speed six-cylinder vertical gas engines, manufactured by E. S. Hindley & Sons, of Bourton, Dorset, will be placed aft. They will have double ignition, and give 180 brake horse-power at 450 revolutions per minute. The gas plant is in duplicate, each division being of 100 horse-power, and it is being constructed by the Power-Gas Corporation, of Stockton-on-Tees. The producers are square in section and will stand side by side on the port side of the vessel, with their faces to the engine-room. The scrubbers will stand forward of the producers, and are about

13 feet high, the upper portion being the wet cooler and the low
the dry scrubber. Both producers and scrubbers are enclosed
tight compartment separated from the engine-room, and furnis
two 12-inch ventilators.

The power of the gas engine will be transmitted to the prope
by means of a "Föttinger" transformer, which, as an interme
tween the gas engine and the propeller shaft, reduces the revol
the latter to any desired number, within certain limits, while the g
is working at full speed. It can also stop or reverse while the g
is running at full speed ahead. Its action is practically instantane
loss of power entailed by its use varies from 3 per cent to 20
according to size, and to the gear or ratio of the number of revol
the prime mover to the number of those of the propeller shaft.
able ratio is from 300 revolutions of the prime mover to about 10
tions of the propeller shaft, and this, in general practice, permit
speed gas engine of light weight and low first cost to be use
propeller of high efficiency. The "Föttinger" transformer is, in
hydraulic clutch, and consists of a centrifugal pump delivering w
a turbine. There are two turbines, one driving ahead, the oth
The water is conveyed to them through a reversing valve actu
hand lever, and when this lever is in its middle position the g
continues to revolve without driving the propeller. The engin
runs in the same direction whether the propeller is going ahead
In *Holzapfel I* the transformer is geared from 450 revolutions o
engine to 120 revolutions per minute of the propeller. The tra
together with the thrust block, is coupled direct to the engine, an
occupy a total length of about 20 feet.

The vessel has a donkey boiler, 5 feet diameter and 8 feet 6 inc
and two steam winches, each of 2 tons capacity. The donkey boil
coal bunker are placed on the starboard side, and they togeth
counterbalance the weight of the gas plant. The bunker supp
gas producer is in the poop, and will contain about 12 tons. It
into the hoppers of the two producers, and very little trimmin
required. It is expected that the consumption of anthracite coa
from 25 cwt. to 30 cwt. daily, as against 3½ tons of steam coal
pound engines of equal power, such as are generally used for v
this size. An air compressor and air cylinders will be fitted fo
the gas engines. When the vessel is about to get under way, th
will be set going and the lever regulating the transformer will
"stop." During the slow speeds and stoppages the engines will
motion, the transformer giving the power to the propeller shaft o
required. The blowing on of the gas producers while they a
lighted up will be effected by an arrangement of air injectors
from the compressed air cylinders.

Holzapfel I being only a small vessel and intended for short v
chiefly for carrying coals from South Wales ports—will not be fi
an evaporator for supplying fresh water to the vaporizers of the p
but the fresh water necessary for this purpose will be carried in
peak tank, and the steam winches will exhaust into this tank to
the supply. The hull, engines, and gas plant will have the highes
Lloyd's Register, and 7½ knots will represent the vessel's average
The Engineer.

AN OCEAN-GOING OIL-ENGINE SHIP.—Considerable interest
awakened in engineering and shipbuilding circles on the *Clyde* th
intimation made by Mr. Russell Ferguson, managing director of
Curle & Co., engineers and shipbuilders, Whiteinch and Finnies
his firm were laying down a vessel of about 5000 tons for foreig
the propulsive machinery of which would consist of oil engin
Diesel type driving twin screws and designed to give the vessel a

12 knots. This intimation was made on the occasion of a complimentary dinner given on Feb. 3, in honor of Mr. Jas. Gilchrist, chairman of the firm, in celebration of the jubilee of his connection with the company; and although the keel of the vessel is not yet laid, the construction of the engines has actually been commenced in the company's engine works at Finnieston. This new vessel, the first on the Clyde to be fitted with internal combustion engines of any size, is for foreign owners, and she is to be about 5000 tons gross and 7000 tons deadweight capacity, while accommodation is also to be provided for a limited number of passengers. In addition to the main propelling engines, there will be another smaller engine of the same type for providing power to generate electricity for driving the winches, windlass, and steering gear, as well as for lighting the vessel. The advantage of the Diesel engine, Mr. Ferguson said, was that it could be worked with the cheapest kind of oil, which could be bought at present for from 34s. to 40s. per ton. There was no magneto or spark required to ignite the charge, this being done by compression, while the engines could be started in five minutes, as compared with fifteen hours required to raise steam with boilers. There were no boilers, no funnels, and no coal bunkers, the oil being carried in specially constructed tanks.—*The Engineer.*

DEVELOPMENTS IN MARINE PROPULSION.—We are at the present time passing through a transition stage in the development of marine engineering which can hardly fail to make history. It seems a very short time since the last word appeared to have been spoken, and a definite limit reached, in the perfection to which reciprocating engine practice could be brought. Multiple-expansion, surface-condensing, superheating, and steam jacketing had all played their several parts in this, and further possible improvement had apparently been reduced to small proportions. The adoption of water-tube boilers, and to a small extent the use of oil fuel, brought about some further increase of efficiency from the fuel consumption and weight carrying point of view, but no serious claim to any large improvement could be made. With the epoch-making introduction of the steam turbine, however, a great advance was effected, and its extremely rapid growth is ample proof of the wide recognition accorded to the successful application of the rotary principle. The next step was the interposition of a steam turbine, between the exhaust of an ordinary reciprocating engine, and the condenser; a greater expansion of the steam being thereby obtained than is possible with reciprocating engines alone. The result was a combination engine, in which the exhausts from two reciprocating engines, driving wing shafts, were brought to a common turbine of large size working at low pressure and driving a center shaft as in the *Otaki, Rotorua,* and *Laurentic,* not to mention the *Olympic* and *Titanic.* A great increase of steam efficiency was obtained by this method.

The great difficulty associated with the application of the Parsons expansion turbine to the propeller shaft directly is that of high revolutions, involving a loss of efficiency at the propellers. Strenuous endeavors are being made to obtain an efficient and reliable means of gearing down the propeller shaft, which shall permit of lower propeller speeds being used. Mr. Parsons' experiment on the *Vespasian,* with direct gearing, has met with much success, and he is now supplying two sets of geared turbines to the Admiralty for torpedo-boat destroyers being built on the *Clyde.* The same effect is obtained by Dr. Föttinger's hydraulic gearing, which is being fitted to a steamer now under construction on the East Coast for foreign owners. An interesting feature of this design is that the water, which is heated by the transmission of so much power, is used to augment the heat of the feed. The performances of these vessels will be watched with great interest. On the other hand, by using a combination of the impulse and expansion turbines a lower speed of revolution is possible, as in the Curtis-Brown installation of H. M. S. *Bristol* and the A. E. G.

German turbine engine, and it is thus hoped to regain the loss of prop efficiency hitherto sustained with turbine engines.

In the meantime, another school of engineering thought is devoting i to exploitation of the internal combustion engine as the ideal marine m For very small sizes, engines, using light spirits hold the field. larger dimensions opinions are divided between gas engines and eng using crude oils. The invention of producer gas plant has made it pos to consider gas engines, driving propeller shafts directly, as serious c petitors in the race. Experiments on quite a large scale have been m not, however, with altogether convincing results. An interesting cas producer gas propulsion is afforded by a vessel approaching completio Dumbarton. This is a 53-foot steel yacht, built for Mr. H. A. Mavoı Glasgow. A gas engine using producer gas drives a dynamo, or gener which in turn supplies power to an electric motor directly connected to propeller shaft. The revolutions are thus brought down to about 350 minute, with which speed a good propeller efficiency should be attain This little vessel represents generally the suggested application of e tricity to the problem of marine propulsion.

Of more serious import, however, is the rapid development taking p in the growth of the oil engine proper. Until quite recently, the intro tion of comparatively small powers for fishing boats has attracted r attention. But now the constant pressure or Diesel type engine is rap making the development of large powers from crude oils possible in ma engines. So far as our own columns have shown, this engine has recei more attention abroad than at home. But there is now to be built on Clyde, at Messrs. Barclay, Curle & Co.'s shipyard, a vessel of 7000 tons d weight—very much greater than anything yet attempted—for which builders are constructing at their engine works two sets of large inte combustion engines of the Diesel type. The vessel is to have twin scre which are expected to give her a speed of 12 knots. The provision starting and stopping, and for reversing rapidly, with other minor det which were successfully developed in the experimental vessels of sma size, are all being incorporated in the larger vessel. Another interes feature about this vessel is the manner in which the auxiliaries are to worked. Hitherto steam has been generally deemed necessary, but in case a smaller engine of the Diesel type will generate electric power the winches, windlass, and steering gear, and provide electric light for vessel. The ship, it is reported, will have no funnels, the intention be presumably to discharge the products of combustion at the water le In this, if the intention is carried out, she will differ from preceding Di engine ships, in which the use of a funnel has been found at least desira Specially constructed oil tanks will take the place of coal bunkers; usual boiler space will be available for cargo; and the oil space will c be about one-fourth of that which would be necessary for a coal-prope vessel of the same dimensions and speed. The crude oil, on which engine may be worked, can be obtained for about 35s. to 40s. per ton, it is estimated by the builders that 100 tons of oil will take the vesse far as a similar ship would be taken for the combustion of 300 tons coal. The ship is for foreign owners, although being built by a Bri firm.

Never, perhaps, has there been such a diversity of new departures marine engineering within a short time as has been recently seen, and are safe in saying that some, if not all, of these will make history. A isfactory reflection is the thought that British engineers are still in van when practical application of new movements is in question.—' *Engineer.*

MECHANICAL STOKING.—Experiments are being carried out on board British tug *Prudent* with a mechanical stoker. The coal is placed i hopper and then distributed over the furnaces. It is claimed that

invention secures a more equal distribution of the fuel. The trials have not yet been exhaustive enough to prove whether the invention is likely to be of great service in ships of the Royal Navy.

TURBINES IN FOREIGN NAVIES.—It was certainly not without a good deal of surprise that the announcement was received concerning the engines of the new American battleships. As is now well known, they are to be of reciprocating type, and apparently, for a period at least, the use of the turbine has been abandoned. The reason given is the presumed more economical working of the reciprocating engine at certain speeds. The Germans are not moved by this consideration. Lathes for the largest turbines now exist at their shipyards, and stations are being built at Hamburg and elsewhere for the testing of turbines at full power before they are placed on board. Great advantage is expected to result from this procedure. The French are employing turbines in all their new ships, but there have been many difficulties, and the blading seems in some cases to have been defective. From this cause, it is believed—though some seem to think the damage has been wilful—faults developed in the turbines of the battleship *Voltaire*, and the destroyers *Cavalier* and *Chasseur*. Be this as it may, considerable repairs have become necessary.—*Army and Navy Gazette*.

MOTOR-DRIVEN WARSHIPS.—*The Essential Facts*.—There is no reason for supposing that any battleships or armored cruisers of the British program for the current financial year will be fitted with internal combustion engines, says the *Engineering Supplement of The Times*. Contracts have been already made for Parsons turbines in all four battleships of that program, and the large cruiser yet to be ordered, it is practically certain, will be equipped similarly. In regard to next year's program we shall see in due time, and must "wait and see." It is hardly credible, however, that such a gigantic experiment as has been suggested will be made this year. The Engineer-in-Chief of the Navy and his staff have shown great courage and resource in facing many new problems, but they have also never failed to exercise a wise discretion and to take due precautions when making new departures. They undoubtedly possess full knowledge of the considerable advances which have been made of late with internal combustion engines of the Diesel and other types both at home and abroad, and they have gained considerable experience with such engines when employed in auxiliary services on board large ships of the Royal Navy or for propelling small vessels. That experience, valuable as it is, will hardly lead to an advance, at a single step, to the machinery for a motor battleship of 36,000 horse-power. In Germany, according to information of a trustworthy nature, a large-scale experiment is in progress, with support from the government.

The following are believed to be the essential facts: Three sets of motor machinery, each set containing three cylinders, are being manufactured, the aggregate power being about 18,000 horse-power, and the maximum power per cylinder about 2000 horse-power. Exhaustive trials are to be made on shore with a representative set of about 6000 horse-power. If the results are satisfactory, it is proposed to fit the three sets in a vessel of the "protected cruiser" type, and to use the motors to drive triple propeller shafts and screws, in place of three sets of reciprocating steam engines which were used prior to the introduction of turbines into vessels of the same class. The internal combustion engines are said to be of the Diesel reversible type, and the principal novelty is the considerable advance made in the power to be developed in each cylinder. This feature is undeniably experimental; if it proves a success the accompanying advantages in regard to weight and space, as well as the disuse of boilers and the economy of oil fuel as compared with coal, will be very considerable. It may be taken for granted that those who are responsible for the experi-

ment will avoid risks as far as possible; but they are proceeding on re sonable lines, and it has been stated that the vessel in which the sea tria will be conducted, if the shore trials realize expectations, could be equipp with steam turbines and boilers in case the motor experiment should n prove successful. This is obviously a reasonable and proper mode of pr cedure in the circumstances.

THE STEAM TURBINE IN GERMANY.—*A Discussion of the Growing Ten ency to Merge the Different Systems into One Standard Type.*—Both America and in Europe the most important of recent developments steam-turbine design seem to be in the direction of the evolution of general standard type embodying the best features of all existing system The merging of systems has progressed less rapidly in America than has in Europe, but the tendency towards standardization is already we marked. Thus, for some of the Westinghouse turbines, the America representatives of the Parsons type, the double-runner velocity stage o the Curtis system has been adopted for the initial expansion, while it i reported that the General Electric Company, the builders of the Curti turbine, have built some units in which the Parsons system is used for th final stages.

The progress of standardization in Germany, where it is perhaps mos apparent, is described by F. E. Junge and E. Heinrich in *Power* for Nov ember 8. "It is an acknowledged fact that the development of steam turbine construction, after having acquired a high degree of thermal ex cellence, tends now toward a standardization of the different system which at present are dominated and characterized by a few simple prin ciples of steam flow and structure. The following discussion of thes principles will be confined merely to axial turbines, because the radia turbine has not so far shown an equal capability of development, at leas for purposes of large-scale power production.

"First. The many-stage reaction principle developed by C. A. Parsons As regards the utilization of steam energy this system is characterized b the fact that the conversion of the potential energy of the steam int kinetic energy takes place not only in the guide-blade channels, but also i those of the rotating part. Regarding construction, the Parsons system i characterized by the use of a drum with dummy pistons and labyrinth packing.

"Second. The many-stage action principle with one row of blades o each rotating wheel, developed by Rateau and modified by Zoelly. A regards the utilization of steam energy this system is characterized by th fact that the conversion of the potential steam energy into kinetic energ takes place in the guiding apparatus only, while the whole kinetic energ of a stage is utilized in a single row of rotating blades. Regarding con struction, the Rateau-Zoelly system is characterized by the employment o several disk wheels and by the separation of the different stages throug guide-wheel disks, which reach unto the hubs of the rotating wheels.

"Third. The many-stage action principle with velocity staging devel oped by Curtis. As regards the utilization of steam energy, this system i characterized by the fact that the whole potential energy of one stage is as a rule, transposed into kinetic energy in expanding nozzles, and furthe that the kinetic energy of each stage is utilized in several rows of revolv ing blades. Regarding construction, the Curtis system possesses rotatin disk wheels, like No. 2, but fewer in number, which are equipped wit several rows of blades; in addition, it possesses deviating blades which ar fixed in the casing.

"The principle of one-stage action has not been included in the above This system, as developed by De Laval, shows in its practical executio several remarkable solutions; for instance, the flexible shaft and the dis wheel with high peripheral velocity. But the very nature of the De Lava turbine, at least in its original form, militates against the attainment o

high capacities. The high peripheral velocity and the resulting high number of revolutions necessitate the employment of gears in order to get down to practicable speeds. Gears for high output have not, however, found favor in stationary practice. In the Riedler-Stumpf turbine the attempt was made to attain reasonable speeds by adopting very large wheel diameters and best material. But practice has evinced that buckets milled into the rim of the wheel would not stand the eroding action of the steam jet, and that the steam consumption increased very materially owing to the destruction of the sharp admission edges of the buckets.

The three above-mentioned fundamental principles of steam-turbine construction have developed each for itself in Germany. Gradually, however, there has been a fusion of the different systems. For example, the A. E. G. has abandoned the Curtis construction of the low-pressure part of its 1500 revolutions per minute type and has adopted the principle of many-stage action as developed by Rateau and Zoelly. Up to this year the pure Curtis principle was followed in its 3000 revolutions per minute type, showing two pressure stages with two velocity stages each. The best known type of this class is the turbine of 1000-kilowatt capacity. But for outputs beyond 1000 kilowatts the A. E. G. now builds the low-pressure part after the Rateau-Zoelly principle. Evidently the cost of construction of the said type of 3000 revolutions per minute, which contains only two rotating wheels with two rows of buckets each and only one guide-wheel disk, is lower than the cost of a turbine of equal output which contains, besides a rotating wheel with two rows of buckets, from five to seven wheels with one row of buckets and the same number of guide-wheel disks. But the severe demand for a low steam-consumption guarantee, which would enable the firm successfully to compete with other German makes, forced the designer to adopt a somewhat more expensive construction. The Bergmann Electric Works build their turbine similarly, using a combination of the Curtis and Rateau principles.

"Even the foremost of the German firms representing the Parsons interests, Brown, Boveri & Co., have, after long hesitation, resolved to follow the example of other builders of reaction turbines. They have replaced the high-pressure stages of the Parsons turbine by a Curtis wheel, reducing the length and weight of the unit enormously. Only for large units and special-service conditions is the pure Parsons principle maintained. Last, but not least, the Curtis principle begins to intrude into the Zoelly syndicate, which, so far, has resisted with tenacity all attempts to change its original mode of construction. The Augsburg Nürnberg Works, members of the syndicate, have just begun to build all of their 3000 revolutions per minute types on a combination principle, using the Curtis and Zoelly features. The Görlitz Machine Works, licensees of Zoelly, have also built normal types of turbines in accordance with the above principle, but only for sizes below 700 kilowatts. The other members and licensees of the Zoelly syndicate have not adopted the new practice.

"Summing up it may be said that turbine construction tends toward the creation of a standard system of unity, which will include all of the best features of the different types. In the present stage of development the following variations exist: First, the combined Curtis and Rateau system; second, the combined Curtis and Parsons system; third, the pure Rateau-Zoelly system; fourth, the pure Parsons system; fifth, the pure Curtis system. The above order of importance has been arranged according to the influence which, in our notion, the various systems exercise upon the art of turbine building for stationary purposes in Germany to-day.—*F. E. Junge and E. Heinrich—Power.*

ENGINEERING PROGRESS IN 1910.—*British Naval Work.*—The Admiralty orders, as always, form a large percentage of the horse-power required from marine engineers. Much, if not all, of last year's program will, of course, find its way into the 1911 return; but it is consoling to reflect that after

the relative inactivity of 1909 no less than about 820,000 shaft horse-pow has been ordered for the Royal Navy since January last, made up by tw colonial cruisers, four "contingent" ships, and the ships of the 1910-191 program, which include twenty torpedo-boat destroyers; this total is ve great, but it appears likely to be eclipsed before long. A great step wa made early in the year in fixing the individual horse-power of the *Lio* class cruisers at no less than 70,000—not far from double the designe power of the *Indomitable* class. The individual power of the battleshi has risen to over 30,000 shaft horse-power, but the cruiser and destroye classes show no increase over 1909. There are only two important shi that carried out trials last year—the battleship *Neptune* and the crui *Indefatigable*. Both ships did remarkably well; the gunnery trials bei also extremely satisfactory. Several *Town* class cruisers have been pass into the fleet, and interesting comparative trial data was obtained from th Curtis turbine cruiser *Bristol* in relation to the four sister ships propell by Parsons turbines. There was found to be a distinct gain in the eff ciency of the propellers of the twin-screw boat compared with the fou shaft Parsons vessels, which, however, was practically entirely neutraliz by the superior thermal efficiency of the latter. The *Bristol* possesses a additional innovation in the shape of superheaters in the boiler uptakes. repetition of the progressive Admiralty policy in appealing to the exper ence of private builders was forthcoming last year in the request made certain firms to tender for "special" destroyers largely on the lines of th circulated specification for the 27-knot destroyers. As a result, orders f six vessels were placed, all of which embody many minor novelties i existing practice, which will thus have a fair trial under naval conditio without detriment to the value of the boats themselves. Thus two orders at Dumbarton will have twin screws and geared turbines to drive the while at least two others will embody a modified velocity compound impulse turbine at the forward or high-pressure end. Rotary air pum and turbine-driven fans find a place in another special design. As regar the year's practical steaming work, we have had some remarkable i stances of reliability and durability from the *Dreadnought* classes, th experience of which has been most satisfactory. The destroyers, howev have experienced many minor troubles, which are not entirely free fro criticism. There have been numerous cases of cruising turbines strippi and a few other less important troubles which are likely to be eradicat in the next classes of boat. The Admiralty design of destroyer has a ready been under trial. It will be remembered that the 1909 boats we not, as had been the case since the early *Hornet* class destroyers, contract for on builders' designs but on Admiralty lines and scantlings. There great credit due to them, and though the trials of the 1909 boats have r vealed sundry points capable of improvement, the result is undoubtedly distinct success. The work done by the submarines this year—by *D 1* mo especially—has been particularly good.

British Mercantile Work.—With the exception of the *Vespasian*, the has been little striking in marine engine work this year at home. O gigantic ship has been launched, the *Olympic*, in which the combined tu bine and reciprocating engine system has been adopted. Another—th "New Cunarder," to use a phrase that became famous all over the wor when speaking of the *Mauretania* and *Lusitania*—has been ordered but barely commenced. A few Channel steamers, none of any striking i portance, have been built; but merchant work generally, though vast improved in quantity since 1909, has nothing striking to commend it in th past twelve months. The Orient Company and one or two other firms ha ordered combined turbo-reciprocating sets, but it does not appear that th well proved economy of the *Otaki* is as yet thoroughly appreciated. Own ers are looking more to the possibilities of the yet untried oil engine th to the proved certainty of previous steam experience. Trade in sm Amazon river vessels has been distinctly brisk, largely due to the unpr

pared state of some of the Amazon companies for the boom in rubber; the difficulty on this, as on other river sources, is the adequate protection of the propeller from floating obstructions or stationary obstacles. The uneconomical stern wheel seems the most reliable solution. On the Atlantic service the performnaces of the *Mauretania* deserve special mention. The most recent feat is crossing to New York and back in twelve days. The trips were run in abnormally heavy weather, and the high average speed attained was quite exceptional. We have known 700-foot 17-knot liners forced to lie to on account of stress of weather of far less apparent force. Two other magnificent liners of lesser speed are under construction for the Cunard Company.

Boilers.—There is no denying the fact that interest in steam generators is far less keen than it was ten or fifteen years ago. This is partly due to the boiler having been overshadowed to a large extent by the engine and propeller questions of recent years and partly to the greater reliability of the naval boiler, which type alone gave real cause for controversy, as the cylindrical boiler was of proved efficiency and durability for mercantile work long before the introduction of the water-tube type in the Royal Navy. There are, however, signs that in those classes of vessels wherein the boiler itself forms a large proportion of the total displacement—such as in fast cross-Channel steamers more especially—that the water-tube will be adopted. Naval experience in the last ten years with the Yarrow or Babcock boilers has been markedly free from the troubles due to design or workmanship such as characterized the earlier naval installations. There really exists no adequate reason against their more general adoption. It is stated in Germany that the two new Hamburg-American liners are to have water-tube boilers of the Schulz type, while there are also two channel steamers being built in the Clyde with this type. The attitude of the Registry Societies against water-tube boilers in insisting on unduly severe survey conditions has hitherto militated against their wider adoption, but with Admiralty experience as a guide there should have been no real necessity to discourage the water-tube boiler any longer. In naval work there is relatively little to record excepting an increased tendency to enforce a still stricter inspection of tubes—if such be possible—but the improved reliability is probably worth it. Superheating is still opposed, though for land turbine plants, where impulse rather than reaction turbines are adopted, there can be no doubt as to its value. As it is, only a few solitary naval vessels have been so fitted in the last year, and there is still no adequate experience gained as to their value.

In some quarters turbine-driven fans are advocated. These were tried in the United States, but some doubt exists as to their economy, though they absorb less space, and are more convenient to place on board ship than the reciprocating type. It is also possible that before long the "mushroom" type of ventilator, with a hinged top for fine weather use, will be more widely adopted. The large open cowl, however efficient it may be for catching air, is open to many objections.

Marine Engines.—Of marine engines, or turbines *per se*, there has been little development of great interest. The triple or quadruple expansion reciprocating engine still holds its own; though the Parsons turbine, built and building, exceeds 5,000,000 shaft horse-power, practically all of the same general type. Improvements in auxiliary machinery have been relatively small. The Weir condensing plant has been found of great service in Admiralty as well as mercantile circles, and is by far the most widely adopted at the present day. Rotary air pumps find favor abroad, but have hardly been introduced into this country. In details of construction, there have been distinct improvements in the quality of materials, especially for propeller, and in high tensile bronze castings for steam fittings or boiler materials, but British makers still seem unable to provide the high quality of steel casting that can be purchased on the Continent or in the United States. Iron castings have been none too good in many cases during the

last two years, and foundry work all round seems capable of improvemen The actual thermal efficiencies attained during the year have been ver good. The steam consumption of the *Town* class cruisers especially wa very low, and in some of the recent large reciprocating engined ships : has been reduced by greater attention to feed-heating, by the use c auxiliary exhaust and better condensing plant.

Geared Turbines.—The adoption of mechanically geared turbines fc marine work was first shown to be a practical proposition early in the yea though elaborate experimental results on large steam turbines drivin slow-running secondary shafts by means of helical gearing were publishe eighteen months ago by the Westinghouse Machine Company of Pitts burg. At the meeting of the Institution of Naval Architects in March 1910, the Hon. C. A. Parsons read a paper describing an application o mechanical gearing to merchant ships of slow speed as carried out by th Parsons Marine Steam Turbine Company. In this he gave very full par ticulars of the details of the installation, together with the comparativ results obtained with the original engines and with the geared turbine system by which it was supplanted. The success of the very practical ex periment thus made was most striking. The cargo vessel *Vespasian*, of 275 feet length and 5400 tons displacement, was purchased, and her ma chinery very thoroughly renovated and overhauled prior to a thorough series of tests being conducted to obtain reliable measurements of coal and water consumption, not only on progressive speed trials, but also in service. On the completion of a voyage to Malta and back the triple-expansion engine was taken out, and a geared turbine system applied in its place to the original shaft and propeller, after which the second series of trials took place under corresponding conditions. The saving in weight by adopt ing the turbine was 25 tons; the engine and its condenser weighed 100 tons, and the installation of turbines, condenser and gearing only 75 tons. The saving in steam consumption at 10 knots—the water was carefully measured in tanks—was practically 15 per cent. Such a result would be remarkable, even if it were only a temporary saving, but the improved economy has been maintained without any deterioration on numerous sub sequent voyages to continental ports. For the same coal consumption the speed was materially increased.

The *Vespasian* represents a very common type of cargo steamer. She is only 1100 horse-power, and the applicability of direct-driven turbines to ships of such low speed had long been recognized as impracticable. Me chanical gearing had also long been discussed as a possible solution; but even after the Westinghouse trials, wherein a 98.5 per cent efficiency of transmission was attained with 6000 horse-power, there still remained— until Mr. Parsons actually conducted his trials—considerable doubt as to its efficiency and durability. The service trips of the *Vespasian* have con firmed this latter quality. It is difficult to understand, therefore, why mor has not been heard of geared turbines. There are two or three destroyer being built for the Admiralty in which gearing is to be adopted, but noth ing more. Builders, we believe, receive far more inquiries for oil engin which incidentally remain relatively untried than they do for geared tu bines. Some people urge that the gearing is noisy, which is quite incorre while others continue to doubt the reliability of the gearing. The first a frivolous objection, while, as to the other, those few whom the *Vespa sian's* record has failed to convince have possibly given the subject inad quate attention in other branches of engineering—motor cars or rolli mills, for example.

Similarly, as regards the hydraulic gear of Dr. Föttinger, there has bee since the trial of the experimental launch, only one small vessel commence The Föttinger gear possesses the advantage of reversibility, but, on t other hand, reduces shaft efficiency. Even so its silence and the remar able smoothness of its operation strongly commend it, and there is r doubt that even with its 85 per cent efficiency its use with turbines wou

effect great economy over reciprocating engine vessels. For vessels in which gas engines are applicable the Föttinger gear admits both of speed reduction and reversibility, and early next year we may expect to hear of the trial results of the vessel now being built on the Tyne with such an installation. Of electric gearing practically nothing except paper proposals has been heard.

INTERNAL COMBUSTION ENGINES.—Probably relatively less of the petrol or producer gas engine has been heard during the past twelve months than of the oil engine, which has apparently made remarkable progress in the last two years on the Continent. Much has been done in this country with motor boats of the hydroplane type—*Pioneer*, *Miranda*, etc.—but these are all fitted with very high speed engines, in spite of their great power, and petrol-driven moreover. The German firms have made, together with the Belgians and the Swiss and Dutch, great strides in oil engine work, and there are several vessels under construction abroad with Diesel engines. No unanimity as to type seems to have been arrived at, and whilst the two-cycle engine is in greatest favor, the four-cycle is yet very well holding its own. Reversibility and elasticity over a big range of power are the two most formidable difficulties to be contended with, but the cost of construction is also very high. Reliability equal with that of the steam engine has yet to be proved, and the geared turbine hovers in the background as a well-proved and reliable rival. In fact, even for auxiliary work, such as dynamo engines, where a reliable oil engine would obviate the use of an auxiliary boiler, air-pump, and feed pump, oil engines are not yet adequately trustworthy. Until they have given proof of their quality, it is absurd to consider their adoption for the largest powers as imminent. The great gain in economy by their use, however, is directing attention to them from all over the world, and many developments may be expected at no distant date. To suggest battleship or destroyer propelling machinery of this type is as yet absurd; the *rôle* of the oil engine is far more likely to be in tramp steamer propulsion, commencing at 1200 or 1500 horse-power.

One of the most important vessels yet completed is the oil-tank ship *Vulcanus*, built and engined by the Nederlandsche Fabriek at Amsterdam. It has a six-cylinder, four-cycle, reversible Diesel engine developing about 500 shaft horse-power. As it is intended to make ocean voyages its progress, as the pioneer in such work, will be watched with the closest interest. A twin-screw vessel is being built now by Blohm & Voss, and in due course will be fitted with two three-cylinder, double-acting, two-cycle Diesel engines. A peculiarity about this engine will be that the piston and rod will be cooled by oil circulation. In the *Vulcanus* they are cooled by air. Schneiders have also taken up the manufacture of marine Diesel engines, and are fitting a big five-masted French sailing vessel with a twin set of four-cylinder, two-cycle engines, each of which will develop about 1000 horse-power, and will together give the vessel a speed of 9½ knots. Burmeister & Wain, of Copenhagen, are also building marine sets of large power, and the Augsberg-Nurnberg have several large reversing engines now under test. They are single-acting two-cycle with six cylinders. At John Cockerill's works a Diesel marine engine, which is particularly interesting because it is capable of running at very low speeds, is being constructed. It has six cylinders on one crank shaft, but the shaft is divided at its center by a clutch. For full speed the clutch is engaged and all cylinders work. For slow speed or reversing the clutch is disengaged and the forward three cylinders drive an air compressor, which supplies air to the aft three cylinders, which then run on compressed air only. A great range of speed is thus made available.

In this country there is comparatively little progress in this direction, but we understand that Richardsons, Westgarth & Co. are taking up the manufacture of marine engines of the Diesel type.

Marine Engineering Abroad.—There have been several important de opments abroad, especially in Germany, where the two big Hamb American liners have been ordered, the trials of the armored cruiser *der Tann*, of 80,000 developed shaft horse-power, have taken place, and introduction of oil-engined sea-going ships commenced. The two f named vessels—both to be built at Hamburg by the Vulcan Company, Blohm & Voss—are of about 80,000 shaft horse-power, and nearly 60 tons displacement. The *Von der Tann* is the first German *Dreadno* type cruiser, and though severely forced on trial she indicated a high gree of economy and attained a mean speed of 27.4 knots.

In France the trials of the first turbined-engined *Dreadnoughts* h taken place, though a severe case of blade stripping on the first st trial severely upset the equanimity of the Admiralty engineers, especi as there have also been sundry cases in the destroyers. The new Me gerie American liner *La France* was satisfactorily launched at St. Naz in October.

In the United States there has been little of great interest. The th experimental scout cruisers still continue to run comparative trials, valuable information of a similar nature is available from the perfo ances of the battleships *Delaware* and *North Dakota*. An interesting c of re-engining a turbine ship with twin-screw reciprocating engines recently occurred. This was the first Curtis turbine vessel *Creole*, wh speed and power was never such as to attract a turbine engineer. T ordinary engines improved her performance occasioned no surprise.

Wireless Telegraphy.—Wireless telegraphy has made considerable vances. The Marconi Wireless Telegraph Company state that Mr. M coni, while at Buenos Aires, received wireless telegrams from the M coni station at Clifden, Ireland, and also from Glace Bay, Nova Sco These were classes of direct transmission, over some 6000 miles. European station at Coltano, in Italy, is now practically complete. periments have taken place on the Continent with apparatus on the Z pelin airship, and it is said that communication was effected up to miles distance, with only 700 watts of energy. The German Colonial C pany of Berlin consider that a system of wireless telegraphy can be in tuted between Nauen, near Berlin, and the German Cameroons Colo 3410 miles apart, provided that a station the size of that at Nauen erected in the colony. The Zeppelin Airship Company has carried some experiments, using the new Telefunken singing spark system, have received messages up to at least 32 miles from the Nauen stati The metallic frame of the airship is found advantageous. A station been erected in the Crystal Palace grounds based upon Mr. Sharm patents. The received signals are of a musical character, and the spark apparatus is comparatively silent. The first Marconi station on the So African coast has recently been established on the Bluff at Durban. It 3-kilowatt station, with a guaranteed minimum range of 250 miles, under very favorable conditions communication was effected at a dista of 1050 miles. It has even been installed in three of the Cuxhaven ste fishing trawlers, and has enabled these vessels to communicate with German ports. Experiments have been made to obtain wireless commu cation with submarines. Messages have been received by submarines, as yet not transmitted from them.—*The Engineer.*

MISCELLANEOUS.

COALING WARSHIPS—NOTES OF PROGRESS. (By Spencer Miller.) stract. Read at the 18th annual meeting of the Society of Naval Archit and Marine Engineers.—One of the United States colliers (purchased c ing the Spanish-American war) discharged with its own gear from four hatches 1200 tons of coal in ten hours, 120 tons per hour, or 30 t per hour per hatch. About 100 men were required to fill the coal bag the hold. For a single hour 50 tons of coal per hatch may be discharg

In contrast to this the United States Navy collier *Hector* discharged 190 tons of coal from one hatch in one hour, employing a self-filling bucket operated by two men. This means a great saving in manual labor as well as a saving of time. In time of war the importance of reducing the labor of coaling is apparent to everybody.

The United States Navy Department began a few years ago to build colliers from their own designs or prescribed characteristics. The first ones were the fleet colliers *Vestal* and *Prometheus*, both 16-knot ships, carrying 6400 tons of coal each. Next were the *Mars*, *Vulcan* and *Hector*, sister ships, with 12 knots speed and 7200 tons carrying capacity. The colliers *Cyclops* and *Neptune*, now under construction, will have 14 knots speed and carry 12,500 tons of coal each. All of these colliers, excepting the *Cyclops*, carry a novel form of coal-discharging gear known as the Marine Transfer. The *Cyclops* will discharge its coal by self-filling buckets, but with a different system of rope leads not at present known by the author.

The Marine Transfer on the colliers *Mars*, *Vulcan* and *Hector* comprises the winches and a novel form of rope lead with blocks and ropes to operate a self-filling bucket for discharging coal from a collier. The masts and booms on these three colliers are cheaper than on the *Vestal* and *Prometheus*, but they are less favorable to the operation of the Marine Transfer. A far greater amount of coal can be taken out of these colliers with the clamshell bucket before trimming is necessary than is possible on the *Vestal*. The operation of the bucket is practically the same on all the colliers.

In the official coaling trials discharging into a barge and using the large bucket:

The *Mars* handled 137 bucket-loads, aggregating 117 tons.

The *Vulcan* handled 155 bucket-loads, aggregating 180 tons.

The *Hector* handled 175 bucket-loads, aggregating 190 tons.

Ordinary seamen on board these colliers were drilled to operate the Marine Transfers with the clamshell buckets, from which it has been established that two fairly intelligent men require about eight hours to become sufficiently proficient to be capable of discharging 100 tons of coal per hour per hatch. One hundred and ninety tons of coal per hour per hatch can be discharged at any time with winchmen of sufficient skill and practice.

The author believes that the maximum efficiency in coaling will be secured by employing clamshell buckets delivering coal in bulk directly into bunkers when possible and when impossible into hoppers on the deck of the ship to be coaled, such hoppers to be arranged so that trucks holding about 1 ton of coal can be pushed beneath the hopper and filled therefrom by the movement of a valve or gate, the coal then to be trucked to various parts of the deck, where it can be dumped through coal chutes to the bunkers. Such a method will reduce the number of men involved to a minimum. It would save the cost of coal bags or baskets. It will save the fatigue of the sailors in shoveling coal and carrying baskets or the dragging of bags of coal on the deck. The author believes that coaling with bags will gradually give way to coaling in bulk, and a great saving in the cost of bags will then accrue to the navy.

There are three important points involved in the design and construction of the Marine Transfer winches:

1. The employment of flat metallic slipping frictions with air-cooling passages.

2. The employment of a lever control, which makes the operation comparatively easy.

3. The position of the operator is such that he can see the bucket in all parts of the hold as well as in every position it might take above the hatch.

The metallic slip frictions on all of these colliers involve the use of an extra hard steel plate attached to the gear and the employment of friction blocks made of a special composition. Wire seems to be the only material of which to make the ropes properly.—*International Marine Engineering.*

THE NEW CUNARDER.—The Cunard Company have placed an order wi
hn Brown & Co., of Clydebank, for the construction of a new Atlan
er, which promises to be the largest ship yet ordered, exceeding t
ympic and the *Titanic,* now being constructed by Harland & Wolff f
: White Star Line, and a Hamburg-Amerika liner being built at t
ımburg Works of the Vulcan Company at Stettin. The design of t
w Cunard ship has not yet been finally settled, and it is therefore pr
ıture to give any particulars, but it is understood that she will be abo
5 feet in length over all, of about 50,000 tons gross register, and, i
der to ensure a sea speed of 23 knots in service, the machinery, whi
ll be of the turbine type, driving four shafts and screws, will be
:ween 50,000 and 60,000 shaft horse-power.—*Engineering.*

NAVAL UNIFORM ESTABLISHED.—In response to the request of a corr
ondent we publish the original order of the Admiralty establishing un
rm which is to be found in an Admiralty order book at the Record Offic
is clear that patterns were considered sufficient without a detailed de
ription of the "cloathing," and there can be little doubt but that th
tterns found at Plymouth in 1846, and now at the Royal United Servic
stitution, were some of those referred to in this Admiralty order:

"By the Commissioners for executing the
Office of Lord High Admiral, &c.

'Whereas we judge it necessary, in order the better to distinguish th
nk of Sea Officers, to establish a Military Uniform cloathing for Ad
rals, Captains, Commanders, and Lieutenants, and judging it also neces
y that persons acting as midshipmen should likewise have an unifor
oathing in order to their carrying the appearance which is necessary t
stinguish their class to be in the Rank of Gentlemen, and give the
tter credit and figure in executing the commands of their superior of
s; you are hereby required and directed to conform yourself to t
d Establishment by wearing cloathing accordingly at all proper times
d to take care that such of the aforesaid officers and midshipmen wh
ıy be from time to time under your command do the like—And it is o
rther direction that no Commission Officer or midshipman do presum
wear any other uniform than what properly belongs to his rank. Pa
ns of which for Admirals and Vice-Admirals and also for Rear-Ad
rals may be seen at the Admiralty Office, and Patterns for each dre
other officers, vizt., Captains who have taken Post three years, and b
s Majesty's late Regulations rank as Colonels; all other Post Captai
o by these Regulations rank as Lieutenant-Colonels; Commanders no
ing Post; and Lieutenants, and likewise for midshipmen, will be lodg
the Navy Office, and with the Storekeeper of H. M. Yard at Plymout

"Given under our hands, etc.,
"13th April, 1748.

"DUNCANNON. WELLBORE ELLIS. JOHN, EARL OF SANDWICH."

The above order was sent to the captains of eighty-seven ships of wa
ven yachts, and two storeships—both captains and ships being named i
: order—and also to the Admiral of the Fleet (Sir John Norris) an
ıeteen other flag officers.—*Army and Navy Gazette.*

FRENCH IMPRESSIONS OF OUR FLEET.—The prolonged sojourn in the Bre
d Cherbourg roadsteads of the Howard and Vreeland divisions of th
S. Battle Fleet, together with the visit of the American seamen t
ris, has attracted general attention in France, making a deep impressio
all circles and causing Frenchmen to realize objectively the rise o
nerican naval power. The sturdy appearance of the crews, as well a
: amiable intercourse which established from the first between Galli
d United States officers, were the object of favorable comment; and i

Paris and provincial papers somewhat exaggerated the unpleasantness which arose in the harbors through the dishonesty of a few traders, they have been, on the other hand, loud in their praise of the formidable looking *Louisianas* and *Georgias*, bristling with guns, and rendered outwardly all the more formidable by being moored alongside obsolete 12,000-ton cruisers of the *St. Louis* and *Carnot* types.

To French naval men who examined them critically from a professional standpoint the United States battleships revealed themselves as splendid war machines, obviously designed by practical men primarily with a view to fighting, but all the same admirably fitted internally with comfortable quarters and up-to-date arrangements, and far in advance of French ships in most respects.

The comparative merits of the United States battle divisions have, of course, been the object of an animated discussion in naval circles, and it is a prevailing opinion here among experts that, outside of the English home fleet, there is nothing in Europe able to tackle Admiral Schroeder's armada. Even the twenty-four battleships which Germany could put into line (by bringing in her reserve) would find themselves excelled in gun power and in general qualities by the sixteen American ships. The *Delaware* and *North Dakota*, with their broadside of ten 305-mm. guns, and the *Michigan* and *South Carolina*, which fire abeam eight guns of similar caliber, are considered as being more than a match for the four *Nassaus*, armed with the inferior 280-mm. weapon and only able to train broadside eight out of the twelve heavy cannon they have on board. It has been calculated—counting only turret guns—that the broadside of the German *Dreadnought* division only amounts to 10,880 kilos, as compared with 13,200 kilos for the four United States all-big-gun ships. And there can be no doubt as to a *Louisiana*, *Georgia* or even a *Idaho* being much more than able to hold her own against a 13,200-ton *Deutschland*, without speaking of the obsolete and weakly armed *Wettins* and *Kaisers*. The American ships of the line would have advantage in all ways over their Teutonic opponents, viz., heavy guns and medium-sized guns of larger calibers (305 against 280 and 240, and 203 and 178 against 170 and 150 mm. weapons) and a superior protective system. The weight of the broadside of the *Georgia*, for instance, is 2566 kilos, against little over 1800 kilos for the German *Deutschland* type. Well it may be said that the "citoyens de la libre Amérique" have got a proper return for the money expended in their fleet.

The *Michigans* and *Delawares* have been frankly admired, and many officers who have visited them have since become warm partisans of the "American" axial line of turrets, judged to offer the greatest practical arc of fire and the highest military utilization of the heavy artillery. In this respect the American visit is likely to have an influence on future French construction, especially on the 1912 ships, which are to carry the new 340-mm. caliber, now being prepared.—*Army and Navy Journal.*

THE PROBLEM OF THE SCHELDT FORTIFICATION.—The little states of Western Europe are at times almost forgotten in the whirl of discussions around strategical policies as evinced from time to time by their more powerful neighbors. What the ultimate future of these little kingdoms will be it is somewhat difficult to foresee, for they are wondering which of their continental confreres will overlap them in the forthcoming struggle of Titans. It is an unenvious position for these buffer states, because, unless the peace of Europe is assured, prosperity for them is out of the question. That it should not be so in these days of treaties and ententes seems to be the thought in all well-balanced minds, but it is the fact of minds being so well balanced to-day that brings home to the small states the terrible meaning of the Droit d'Augarie, which permits a belligerent in a case of absolute necessity to use or destroy the property of a neutral state—this is looking at it from the light of Holland or Belgium—two well-

established states which just now are the unwilling cynosure of all on the political horizon.

The interest aroused by Holland's proposal to fortify certain parts of territory on the River Scheldt—which, of course, from a legal point view, she is perfectly entitled to do—has given rise to a feeling of i curity as regards the independence and neutrality of Belgium. This la is guaranteed by five other European Powers and the history of that gu antee is worthy of some note at the present moment. In 1814, Prus Russia, England, and Austria, after long deliberations, etc., decided to p if possible, a check on the roving ambitions of France, and called i being the kingdom of the Netherlands, which comprised both Holla and Belgium. The annexation was attended with a certain amount danger, but this soon passed, only to be replaced, however, by a state internal strife between the two races that was something akin to civil w The fact of the matter was that the two countries were so entirely differ in history, language, religion, and many other essential factors to unifi tion, that the union proved impossible, and in 1830, to put a stop to t internal strife between the two peoples, a conference was held in Londo the four original Powers and France attending—which decided that t only solution of the problem was to make Belgium a separate state a guarantee her independence. This the five Powers undertook to do, b the conditions attached to the guarantee were very much resented by t Belgians, who eventually elected Prince Leopold of Saxe-Coburg as th King, having for their intention the creation and vindication, out of th own strength, of an independence which would relieve them of all t national and financial disadvantages that they had undertaken by th acceptance of the terms of the Conference of London. Had Belgiu possessed at that time sagacious instead of incompetent statesmen all mig have been well, but the sympathy of Europe was soon weaned from h owing to her wayward actions and evident incompetence—both in coun and on the battlefield.

King William of Holland invaded Belgium at that period, and Fran had to step in and protect the new state, the ultimate result being that t Powers again drew up articles, which were even less to Belgium's adva tage than those which had provoked the trouble. Holland refused accept these articles, or to recognize Belgium. So the Powers enforc peace between the two nations, but contented themselves with sitting o the fence, until in 1838 King William made tardy overtures to the Powe to adjust their territorial and financial difficulties. This was done, a with one important exception, the terms imposed by the Powers in 18 apply to Belgium to this day. Her independence is absolutely guarante by the five Powers, but it is well to bear in mind that the five Powe *must act together,* so that if one Power abstains (say Germany, for e ample), then the action of the other four might probably be render invalid. To follow the matter intelligently one must keep in mind t fact that throughout all these *pourparlers,* Holland retained control of th commodious approach to Antwerp—the mouth of the Scheldt—and it w this fact that caused so much ill-feeling and protest from Belgium for quarter of a century that it led to the freeing of the River Scheldt in 18 and for this concession Holland received a sum of money which has be placed at about £1,300,000, the greater part of which was paid by t Powers concerned in the guarantee. As a result of that payment t Scheldt became an open waterway of the world.

It can, therefore, be readily understood that any contributing party the freeing of the river has some right of interest and claim to be co sulted, whilst Belgium, after the years of prosperity and comparative ca for her that have elapsed, may well be excused if she returns to that at tude of resistance which existed between her and Holland from the ve outset of the original settlements, for if the fortification of the Sche is carried out, it brings her back to the days of her former insecurity a

humiliation, for in the event of hostilities Antwerp would lie at the mercy of Belgium's old antagonist or her masters. Further, it would appear that having been paid to free the river in 1863, any erection of works calculated to jeopardize such freedom would be somewhat out of order. It is, of course, deplorable from all points of view to contemplate the probable violation of the territory of a neutral state, but the necessities of war know so few defined courses that the Right of Angary is fast attaining universal acceptance. To combat this evil one has to watch most carefully the trend of national strategy, meeting Greek with Greek, and guarding, if possible, in their initial stages, against inacceptable situations which would arise were hostilities to break out, and which, so far as operations of any extent on the Continent are concerned, commonly arise between France and her neighbors. The well-defined utterances of the French Ministers make it quite clear that the fortification of the Scheldt is not acceptable, whilst on the other hand German legislators seem to encourage the idea, no doubt in furtherance of their strategic policy; for anyone who has noticed the preparations and provisions for detraining, etc., which she has necessarily to make in order to be ready for concentration, will have observed that the axis of attack or concentration has shifted considerably of late, and in such a manner as to indicate that the neutrality of the Netherlands in case of hostilities is threatened thereby.

It is to be hoped that no calamity may arise from the Scheldt problem, which is only one of the many sidewinds that have for a long time past been forcing matters in a certain direction. The mariner entrusted with the Ship of State would do well, however, to watch closely the drift of this political and strategical gulf stream.—*United Service Gazette.*

BUILDING OF THE NEW CANADIAN NAVY.—The Dominion Government have announced from Ottawa that contracts for the proposed ships to form the beginning of a Canadian navy will be fixed in the near future. It is understood that six British shipbuilding firms have been invited to tender for the new construction, and offers have been made by some Canadian firms to undertake the work. The tenders at present asked for are for four cruisers, presumably of the *Bristol* type, and six destroyers. It is stated that the contracts for all of the ten vessels will be entrusted to a single contractor, and the reason for this is probably the decision of the Ottawa government that all of the vessels must be built in Canada.

The question at once arises—Where are they to be built? Already there are rumors that point to Vancouver, on the Pacific coast, as destined to be the favored locality. It is situated on the finest natural harbor of Canada, and the construction of a large dry dock is to be immediately proceeded with there. Proposals are also on foot for building a floating dock capable of lifting ships of 15,000 tons displacement.

The Pacific coast offers very many attractions to a shipbuilder. Its harbors are as fine as any on the Atlantic coast, and facilities for obtaining material are good. Coal and iron are obtainable at the very door, and if requisite capital to erect adequate smelting works and rolling mills were forthcoming, the business of steel shipbuilding, which has already reached respectable growth, would receive a tremendous incentive. If it be true that the new Canadian navy is to be built at this port, its future as a shipbuilding center is assured. The coasting trade alone provides a considerable amount of repair work, much of which is at present diverted to other ports from lack of docking accommodation. Such firms as Harland & Wolff, Swan, Hunter, and Wigham Richardson, and others have had representatives on the spot making investigations as to the possibilities of development along these lines.

Vancouver has one decided advantage over Atlantic ports in its Pacific slope climate, which would render the business of shipbuilding possible all the year round. Burrard Inlet, upon which it stands, seems to possess all the requirements which appeal to the professional and business instincts

of the shipbuilder. It is an ideal site for the purpose. The harbor is ma nificent, being landlocked, and therefore quite sheltered. Within the Fi Narrows, known as the Lion's Gate, the shore of the harbor proper, n including the north arm of Burrard Inlet, extends 25 miles, while the wid is 2¼ miles. The low-water depth at the wharves is 26 feet, and in tl stream about 30 fathoms. The average rise and fall of tide is 13½ fe At low tide the present entrance to the harbor has a width of 700 feet its narrowest point. It is, however, to be widened to 1200 feet, a dredged to a uniform depth of 30 feet to 35 feet at dead low water. contract has been placed by the Dominion government for a special dredg to do this work, which will be completed, it is estimated, in about thr years, including the removal of some shoals and a projecting reef. At t wharves of the shipbuilding business at present in operation there is depth of 30 feet of water at low tide, so that war vessels could be afloat all times.

Burrard Inlet, then, needs little artificial improvement to make it sui able as a shipbuilding center, whether for warships or merchant vessel and it is likely to be a strong, if not the strongest, competitor for the co struction of the new Canadian Navy. Indeed, the site at North Vancouve upon which large shipyards are to be erected in the near or more dista future, is practically settled; it is on the north shore of the inlet, whe there is plenty of deep water close in shore. The Imperial Dry Dock an Shipbuilding Company has been granted a subsidy from the Dominio government, and Roche Point has been selected as the site of a new doc Victoria, 84 miles from Vancouver, has at present the lead in shipbuildin when compared with Vancouver, and has turned out such vessels as t Princess Royal and Princess Beatrice, for the C. P. R. line. Notwit standing this, Vancouver appears from its natural suitability for the pu pose, destined to become the largest shipbuilding and commercial cent on that part of the Pacific coast. It possesses with the minimum of e penditure, a harbor such as many seaports cannot secure at any price. T only shipbuilding now carried on there of any importance is on quite small scale, but it is up-to-date so far as it has gone, and although t larger of the two firms employs less than a hundred hands, and it is quite recent establishment, it is intended to be the nucleus of a mu larger concern.

There are large coal deposits in the immediate neighborhood; a ne mining corporation called the Canadian Collieries Company, has recent acquired an immense coalfield on Vancouver Island, and has devoted thr million dollars to opening up and developing of new mines on their pro erty, and to increasing the output of those already in operation. M chanical haulage, by means of electric power, generated by a 50,0 horse-power water-fall will be installed, and this source of power will the same time supply other affiliated businesses.

The beneficial effects of this progressive policy will be felt by all bu ness men in the district, for all need coal; and specially is it important Vancouver is to become an important shipbuilding center. The possib ties of early development in this district has been foreseen by many nota British firms. Cammell, Laird & Co., for instance, do a large trade w the various mining companies and manufacturers of the province. Stam dies, high-speed tool steels, hollow-drill steels, nickel steel, and ot specialties of the firm, are supplied in large quantities through the resid agent in Vancouver.

It is a trite saying, that progress of trade in a seaport is infallibly in cated by the appearance of the wharves on the water front, and this p is no exception. Her rapidly extending wharfage is generally in a m or less congested condition. In the Vancouver service, Messrs. Alf Holt & Co., of the Blue Funnel line as it is termed, maintain a fleet eight fine vessels. The C. P. R. steamers, and the Andrew Weir line, b run constantly between Vancouver and the Orient. The Canadian-Aust

ian mail service to Sydney is carried on by the Union Steamship Company of New Zealand, and a large cargo business is done with goods from the Atlantic coast and Europe, which are transported across the Isthmus of Tehuantepec by the railway from Puerto-Mexico, to Salina Cruz, and thence re-shipped to ports on the Pacific coast. This latter route is so much cheaper than the trans-continental railway freight, that a consignment of goods from, say, Montreal to Vancouver would be carried *via* the Isthmus for little more than half the overland railway freight across the Continent.

Five years, or even three years ago, export of Canadian grain from Vancouver was a dream only entertained by one or two far-seeing and optimistic individuals. About two years ago the probability of Vancouver becoming a great factor in the shipment of grain from Alberta and Saskatchewan began to attract atention, and to-day she is a grain-exporting center whose output is only limited by the present dimensions of the demand for Alberta wheat. When the Panama Canal is opened there will probably be a great deflection of the present eastward flux of wheat from Alberta, Saskatchewan, and Manitoba to the western route *via* Vancouver, with a very considerable saving of time as compared with the lake route. Vancouver harbor is open and free from ice all the year round, and great things are expected of the A. B. C. route—Alberta British Columbia—as a great exporting channel for Canadian grain.

The growth of the railway systems of British Columbia is commensurate with expansions apparent in other directions, and Vancouver is fast becoming one of the biggest railway centers on the Pacific coast. The question is, will its natural advantages cause it to become the chief seaport of that coast? Basing judgment on its geographical and terminal position, it appears probable that it will. For nearly twenty years the C. P. R. was the only railway entering the city. The Great Northern and the Northern Pacific came later, giving an example likely to be soon followed by others. Three years will see the Canadian Northern connection complete with the East. The Grand Trunk Pacific has engineering parties in the field, with Vancouver as the main objective, and its line will probably be completed within five years. Other subordinate lines are also in construction.

All this goes to show that the Dominion government have every reason to favor Vancouver as a likely position for building and equipping their new navy. By the time the first instalment of it is in being, there will be a valuable national asset to protect there, and one can easily imagine how strong an appeal such a natural harbor as Burrard Inlet must make to both the technical and strategical components of the Dominion government.—*The Engineer.*

NAUTICAL RESEARCH.—The Society for Nautical Research has been launched successfully, with the practical good wish that all associated in the undertaking may progress and prosper. It has, indeed, in its constitution many elements of success, and it starts under the best auspices for a long and useful life. The initial issue of its journal will soon make its appearance, and will afford a full indication of the purpose and objects of the society. It is quite well that these should be made clear, because the better they are known and appreciated, the more likely it is that the foundations of the society will be firmly and strongly laid, and the wider its sphere of activity will become. It is important to dwell, for example, upon the scope of the work of the society as shown in its title and also in that of its journal. The former, it will be noticed, comprises all nautical matters, and therefore includes much more than what is strictly naval, while the latter emphasizes the extension of the field of its research to seafaring matters relating to "all ages and among all nations." The influence of maritime life and maritime environment is but partly known unless its first principles are studied, and inquiry carried back to the earliest endeavors in this direction, while it must exclude nothing, however remote, which

can throw light upon its progress and development. That public interest in naval matters has grown enormously of late years there is plenty of evidence to show, but it is essential that this interest should be extended to matters which, while not perhaps distinctly naval, have a direct bearing upon the study of seafaring in its philosophical, scientific, and professional aspects. It is to foster this study and to simplify the task of students that the Society for Nautical Research has been established.

There are two points of interest about the society which call for special mention. First, its composition and membership, and secondly, its method of procedure. The governing body of the society is thoroughly representative of all the varied interests to which the new institution appeals. It has as its president Vice-Admiral H. S. H. Prince Louis of Battenberg, and among its vice-presidents are two other naval officers, Sir Cyprian Bridge and Sir Reginald Custance. There are also in this list Lord Brassey, the Lord Warden of the Cinque Ports; Lord Inverclyde, whose connection with the great shipping interests is well known; Sir Clements Markham, the late president of the Royal Geographical Society; historians are represented by Sir John Knox Laughton and Professor C. H. Firth; Sir Philip Watts represents in a unique manner naval architecture; Dr. Edmond Warre, the late headmaster of Eton, stands for classical scholarship; while the name of the distinguished Royal Academician, Mr. W. L. Wyllie, aptly indicates the connection of the society with naval art. Similarly, in the Council, not only is the navy represented, but nautical research, literature, and art, discovery and exploration, yachting, charitable endeavor among seamen, and many other branches of maritime affairs. The society is, therefore, far from being exclusively governed by naval officers, and this is as it should be, seeing that amongst its members are men of many professions and callings, seamen both of the navy and of the mercantile marine, naval architects, historians, antiquaries, scientists, underwriters, lawyers, artists, and many others whose work brings them in touch with the sea. Its membership extends, indeed, to every quarter of the globe, and includes many foreigners interested in the subjects with which it deals. This widening of its base should be of the greatest value when the society gets into full working order, for without help from abroad it would be difficult to obtain information upon many matters which the society is established to study. It is here also that the journal of the society, the *Mariner's Mirror*, should be of immense service as a "means of intercommunication between members of the society." It is not so much to be expected, perhaps, that any large number of members will undertake independent research work, but all can help, either by sending inquiries to the journal or by writing for it short articles on subjects in which they are specially interested. In this way it may be hoped that a comparative study of maritime methods and customs will be encouraged, and the contemporary usage of our own and each foreign marine explained and elucidated.

It is, however, the columns devoted to notes and queries in the *Mariner's Mirror* which will probably be found most attractive by the largest number of members. It is these columns also which should be in time productive of the best results towards the fulfilment of the objects of the society. That the society should be able, from its own resources, to answer any kind of nautical question is, of course, the ideal which it will set before itself. But this can only be realized if members, as well as sending in questions, will also give assistance in answering those put by others. That there is a very wide field for inquiry is suggested by the headings of various sections of the work, such as antiquities, architecture, art, bibliography, biography, equipment, folk-lore, history, laws and customs, organization, technology, etc. Probably the questions will generally fall under one of two heads—first, those which are concerned with the design, structure, and equipment of ships and the bearing these matters have upon strategy and tactics; and, secondly, those relating to the customs, habits,

usages, and conventions of the sea. The questions in the first category may be the more important from many points of view, but those in the second will probably have the widest interest. There will be demands for missing portraits and for illustrations of early ships and sailors. There are many terms, both in ancient and present use, for which explanation will be desired. Then, again, the origin of customs, the use of flags, and the antiquity or meaning of various practices will call for elucidation. There is much about the dress and pay of the seaman which it is desirable to learn, and then there are many recondite subjects, like the institution of freemasonry afloat, and the encouragement of theatricals in the ships of the blockading squadrons, with similar matters having a special interest of their own. Of course, there are many such questions to which it will be difficult to find answers, and, in any case, answers can only be found through some recognized method of intercommunication such as the Society for Nautical Research is now going to supply. It is to be hoped, therefore, that the society will find support in many unexpected quarters, that it may flourish, and be able in the future to make a start upon the still more ambitious projects which it has in view.—*Army and Navy Gazette.*

NAUTICAL RESEARCH.—At the first annual general meeting of the Society for Nautical Research, which was held at the Royal United Service Institution, the announcement was made that the Admiralty would subscribe for a large number of copies of the new journal which the society is to publish monthly under the title of the *Mariner's Mirror.* The original *Mariner's Mirror* from which the title is derived was a Dutch work called "Speculum Nauticum," by Lucas Wagenaar, published in 1584, which was translated by Anthony Ashley in 1588, the year of the Armada, and issued as the Mariner's Mirror. The new monthly is to serve as a medium of intercommunication between members of the society, and its scope is well illustrated in the sub-title, which reads: "Wherein may be discovered his (i.e., the Mariner's) Art, Craft, and Mystery, after the manner of their use in all Ages and among All Nations." Mr. L. G. Carr Laughton, to whom the founding of the new society is mainly due, will act as editor, and no one better equipped for such a position could have been found. The objects of the society are "to encourage research into nautical antiquities, into matters relating to seafaring and shipbuilding in all ages and among all nations, into the language and customs of the sea, and into other subjects of nautical interest," and those who have not already become members should send as soon as possible to the secretary at 5, Ruvigny Mansions, Putney, S. W., in order to receive the first number of the journal.

THE ARMAMENT OF BATTLESHIPS.—The general principles of warship designs belong to no one nation. It needs, however, the practical as well as the theoretical experience of past years, gained both at sea and in office, of experimental work afloat and ashore, and of design work tempered by the judgment of its unbiassed users, to produce a ship, especially one for purposes of war, in which everything is not only placed to the best advantage, but which shall simultaneously possess the important quality of fighting power associated with peace time convenience and habitability. Just at the present moment, when the competition in naval armaments has pressed to the very utmost the output resources of the great armament firms in England, Germany, and the United States, the views of Sir William White, as they appear in an interesting paper on the subject of battleship armaments to the Society of Naval Architects and Marine Engineers in New York, are of more than usual interest. Sir William White has probably designed more warships than any other naval architect, and his views have invariably been expressed with a temperate logic that goes far to carry conviction in the face of marked and able differences of view,

enunciated more emphatically, but almost inevitably based on shorter experience of the subject under discussion. Sir William's views in his latest paper indicate very clearly that his reputation for clarity of exposition has lost none of its force since he resigned the position of Chief Constructor to the Royal Navy.

The arguments in the paper under discussion reflect very fairly the views of the two camps into which gunnery schools may be said to be divided. One is the all-big-gun one-caliber school, while the other advocates a secondary armament for battle purposes. As Sir William points out at the beginning of his paper, the fundamental idea which has governed the armaments of warships in all ages is the desire to provide means of offence which will enable a ship to destroy her adversary in the shortest possible time with the minimum damage to herself, and active offence still constitutes the best, though not the only means of doing so. The best arrangement of armament for this purpose is discussed largely on the lines of Sir William's criticism of Admiral Bacon's paper on the "Battleship of the Future," read before the Institution of Naval Architects in London a year ago, and more space being at his disposal on this occasion, the pros and cons of the *Dreadnought* type are comprehensively analyzed, and deliberate opinions expressed as a result. Let it be said at once that Sir William advocates the re-adoption of the 6-inch gun as a fighting weapon in association with not more than four twin center line turrets arranged as in the *South Carolina*, an arrangement which it is said is to be adopted in the new Japanese ship being built at Barrow. Whether the big-gun advocates will believe that in the latter case the secondary armament is for fighting or for anti-torpedo boat purposes is another matter.

It is generally agreed that battle ranges have inevitably increased of late years, owing to the development of the torpedo, and to systems of fire control associated with improved gunnery. Conflicting views are held as to what the range will be. Climatic conditions, and a serious intention of attaining a decisive issue, may tend to reduce the range that would be chosen by the faster all-big-gun ships. Herein lies the crux of the situation. When the earlier *Dreadnoughts* were built, their speed gave them the advantage of choosing the range. Now that there are numerous ships of this type, as well as much faster torpedo craft afloat, there is a strong tendency to develop the smaller weapons. But for what purpose? Not for battleship attack directly. For indirect attack, for keeping up a "blanketing" fire with the object of making it difficult for the enemy to see the attacking ship and on the off chance of their effecting damage to unarmored structures and communications which influence fighting efficiency they may be useful, but it becomes a question, as Admiral Bacon said, as to whether adequate value for tonnage involved is obtained by their adoption. Obviously if they are installed at all they can be used for any or all purposes as long as they remain in action. The "volume of fire" obtainable from such quick firing would, some say, inflict considerable damage, and the experience of the Russians at Tshushima is generally dragged in to prove it. It is in this case. Well, in Captain Semenoff's book, quoted in the paper under review, we find on page 124 the remark: "That's only a 6-inch; no more 'portmanteaux' now!"—the word referring to the Japanese 12-inch shell. Again, on page 135: "There was a loud crash . . . . this was not a 6-inch shell, but the 'portmanteaux' again. The men became seized with panic. . . . ." Semenoff tells ably of the utter destruction due to shell fire, but his words are apt to be misread; the heavy shell was what they feared, and a similar well-directed fire from the Russian ships—secondary or primary, or big torpedo—would have kept the Japanese far further away, obviously leaving the action even more to a question of "portmanteaux." With this practical experience in view, it is impossible to reconcile Sir William White's reason for believing that actual trials do not confirm the objection to mixed armaments on the ground that the simultaneous discharge of guns of different calibers

must be accompanied by diminished efficiency in the control of fire and in the proportion of hits to rounds made by guns of different calibers. As we stated some time ago, when gun fire is handled so as to obtain hits, not merely volume of fire, the rapidity of discharge is much below the possible rapidity of fire of the gun. Admiral Bacon suggests that it is merely a quarter of the potential rapidity, and aptly remarks that rapidity of fire, unaccompanied by rapidity of hitting, is a futile waste of ammunition. We hold most strongly that in the *King Edward* class, for instance, the accuracy of 6-inch fire is materially affected by the simultaneous discharge of the 9.2-inch and 12-inch guns. It suffers also in rapidity from the smoke nuisance.

In referring to the number of heavy guns to be mounted, Sir William advocates pairs, and goes on to note the extraordinary Italian practice of mounting three triple and two twin turrets in the *Dante Alighieri* class. Triple turrets involve insuperable objections to practical gunners of the "hit-the-target" order; beside being too many eggs in one basket they suffer from smoke interference and "throw-off" to an excessive extent. The relationship of protective material and the adequate support of the same also receives attention. In many foreign vessels we find turret roller paths fixed directly to or supported on the vertical barbette armor—a most dangerous practice, as in action the combined efficiency of the heavy gun armament, in spite of heavy blows on the protective armor, is a primary consideration. Adequate clearance between fixed and moving portions of a turret should always be allowed in spite of the increased overall dimensions and weight necessary. Reference is made to the maximum number of heavy guns that should be carried by a warship. Here the author is on much safer ground. In tonnage, value for effect obtainable, it is hard to believe that it is possible to improve on the arrangement, first adopted in the United States battleship *Michigan*, of four twin turrets on the center line, the two inner turrets firing over the two end turrets. Such an arrangement possesses the great advantage of minimum interference between turrets due to "blast." The system adopted in the *Inflexible* class, in the *Von der Tann* or the Spanish battleships, of having two center line and two echelon turrets, really reduces these vessels in practice to the status—considering broadside work only—of six-gun ships. On paper, the echelon arrangement allows three pairs of turrets to fire ahead and astern on the keel line. On board, such a discharge causes unpleasant consequences, and the limits of safe training in practice are considerably less than the extremes shown on the drawings. Of course, automatic danger signals—generally shrill buzzers by the side of the turret training levers—are supplied to warn the gun-layer when he risks his own or his neighbor's comfort from blast, but these are extremely apt to be unreliable in action, and the system of mounting guns to avoid this, even if the number of heavy guns be reduced, will probably be found best in service. The advantage conferred by confining the primary armament to the ends of a ship, as far as magazine accommodation is concerned, is very considerable. Side turrets, as in the *Dreadnought* or *Minas Giraes*, are inconvenient—the *Nassau* is very bad with four large turrets crowded together—owing to the difficulty experienced of making a good boiler and engine-room arrangement. Sir William White does not touch on the point beyond referring to the objection to mixing stokeholds and magazines, but it entails probably an additional row of boilers to make up for the staggered units cut out by an echelon arrangement, or an increased length over the machinery space to allow for a transverse magazine. This involves a corresponding addition to the length, weight, and cost of the heavy belt armor. In view of this and the question of interference, his deliberately expressed convictions that in no case is it desirable to mount more than eight heavy guns in a single ship, and that these are best arranged in four positions as in the *Michigan* class, will meet with less criticism than his thir[illegible] that they should be supplemented by a powerful and well-protecte[illegible]

dary armament. A large number of naval officers want a protected 6-inch battery reintroduced, in spite of their expressed conviction that its fire may be discounted at ordinary battle ranges when accompanied by a 12-inch gun fire. Here is where Sir William White takes an opposite view. A secondary battery mounted as in the *Michigan* on the upper deck is, in our opinion, vastly better than the corresponding main deck battery of the *Delaware*. With, however, the smoke nuisance from the heavy guns, the continual anticipation of blast effect from overhead and the lower rate of fire inevitable from these causes, as well as from the desire for accuracy, it is hard to agree with him. The naval desire for the re-introduction of the 6-inch gun arises from a belief that it is a better anti-torpedo gun than the 4-inch. Opinions on this point also differ widely. If the increased caliber of heavy gun tends to put up battle ranges, then it probably is; but, as we stated in the article we referred to, the 4-inch should also be retained, in our opinion, for mounting in the superstructure.

At the conclusion of his paper Sir William White turns to the important point of future gun caliber, and draws a trenchant parallel between present practice and that of twenty years ago. All the arguments that held good for the increase from 12 inches to 13.5 inches hold good for an early advance to 15 inches or 16 inches. Such a gun is being made, we believe, at the present time. No argument is raised against such a caliber, except that of larger or more costly ships. This has never been heeded. Warships of all kinds are generally smaller than merchant vessels, and for many years the largest have never exceeded about 60 per cent of the greatest mercantile displacement. There are at present at least four ships being built with over 60,000 tons full load displacement, and an increase in warship size is inevitable in the early future. So it is with speed. The *Von der Tann* and *Lion* will set examples of a far-reaching kind. Nothing is said of the tactical influence of speed or armament in the paper under review, but it is obviously considerable. Meanwhile, in spite of Sir William White's generous treatment of the subject, we feel assured that the big-gun school, adhering to the results of their practical experience, will remain unconvinced that for fighting purposes anything less than the biggest convenient gun is worth having.—*The Engineer.*

ANNUAL REPORT OF THE SECRETARY AND TREASURER OF THE U. S. NAVAL INSTITUTE.

To the Officers and Members of the Institute:

Gentlemen:—I have the honor to submit the following report for the year ending December 31, 1910.

Itemized Cash Account.

Receipts for the Year 1910.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Dues	$1,794 01	$417 45	$170 25	$145 65	$2,527 36
Subscriptions	905 46	102 79	245 60	277 05	1,530 90
Sale of books	6,078 35	4,914 51	7,012 79	6,859 71	24,865 36
Sale of Proceedings	22 76	6 23	14 16	11 94	55 09
Advertisements	120 46	349 66	14 38	104 79	589 29
Interest on investments	437 59	397 87	706 15	394 95	1,936 56
Postage	3 74	6 67	2 33	4 45	17 19
Binding	20 38	1 70	1 70	0 00	23 78
Expressage	70	30	0 00	0 00	100
Credits	17 50	0 00	6 24	6 03	29 77
Baltimore and Ohio Bonds	6,010 00	0 00	0 00	0 00	6,010 00
Premium on money orders and drafts	16	62	0 00	29	1 07
Life Member's fee	0 00	30 00	0 00	0 00	30 00
Rebates on insurance	0 00	0 00	0 00	71 10	71 10
Totals	$15,411 11	$6,227 80	$8,173 60	$7,875 96	$37,688 47

EXPENDITURES DURING THE YEAR 1910.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Printing and binding Proceedings	$828 42	$946 37	$972 16	$804 30	$3,551 25
Printing and binding extra publications	1,953 56	1,932 04	2,316 41	3,795 07	9,997 08
Salaries	780 00	780 00	780 00	795 00	3,135 00
Contributors	501 00	662 00	455 00	675 00	2,293 00
Authors of text books	80 00	676 14	618 60	2,537 95	3,912 69
Postage	152 99	132 82	139 92	129 71	555 44
Stationery	65 92	20 59	91 90	18 70	197 11
Expressage	32 32	23 13	12 01	17 58	85 04
Telegrams	6 50	1 09	1 36	1 78	10 73
Purchase of books for sale	33 56	54 81	4 65	51 70	144 72
Prize Essay award	215 50	10 75	0 00	0 00	226 25
Honorable Mention award	75 00	0 00	0 00	0 00	75 00
Advertising	0 00	0 00	25 00	0 00	25 00
Furniture	0 00	43 65	44 70	0 00	88 35
Discount on draft	0 00	0 00	22	24	46
Purchase of bonds	6,010 00	0 00	0 00	0 00	6,010 00
Typewriting	3 50	12 45	0 00	0 00	15 95
Rebates	5 00	1 15	0 00	6 43	12 58
Transferred from General to Reserve Fund	1,980 00	0 00	0 00	0 00	1,980 00
Rent Safe Deposit box	0 00	5 00	0 00	0 00	5 00
Remodeling typewriter	0 00	32 50	0 00	0 00	32 50
Office expense	0 00	0 00	0 00	3 64	3 64
Insurance on Institute property	0 00	0 00	0 00	80 00	80 00
Miscellaneous	0 00	2 50	1 00	8 75	12 25
Totals	$12,723 27	$5,336 99	$5,462 93	$8,925 85	$32,449 04

SUMMARY.

Balance unexpended January 1, 1910	$46,202.93
Total receipts for the year 1910	37,688.47
	$83,891.40
Total expenditures for the year 1910	32,449.04
Balance unexpended January 1, 1911	$51,442.36
Bills receivable for back dues	868.12
" " " binding	20.02
" " " subscriptions	143.50
" " " advertisements	627.50
" " " books	2,662.54

Interest due on money invested	112.50
Value of back numbers of Proceedings	200.00
" " Institute property	300.00
" " extra publications	1,000.00
	$57,376.54
Liabilities	943.97
Total assets	$56,432.57

RESERVE FUND.

Baltimore & Ohio Railroad Bonds	$6,663.14

The balance, $51,442.36, unexpended January 1, 1911, is distributed as follows:

Seamen's Bank for Savings, New York, N. Y	$3,000.00
Rhode Island Hospital Trust Company	2,815.68
Society for Savings, Hartford, Conn	2,856.82
Southern Railway Bonds	6,745.14
Washington Electric Railroad and El. Co.'s Bonds	1,715.00
Northern Pacific and Great Northern Bonds	12,903.14
Potomac Electric Power Co.'s Bonds	2,115.00
Northern Pacific Railway Bonds	8,902.45
Baltimore & Ohio Railroad Bonds	2,238.11
Cash in Farmers' National Bank	6,615.93
Checks in safe, Institute office	1,493.12
Money Orders in safe, Institute office	5.00
Cash in safe, Institute office	36.97
	$51,442.36

Respectfully,

PHILIP R. ALGER, *Professor, U. S. Navy,*
Secretary and Treasurer.

The books of the Naval Institute have been examined from January 19, 1910, to December 31, 1910, and found to be correct, and the balance sheet verified.

W. H. G. BULLARD, Commander, U. S. Navy,
E. H. DURELL, Commander, U. S. Navy,
GEO. R. MARVELL, Commander, U. S. Navy,
Auditing Committee.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay. 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan. U. S. N.

1880.

"**The Naval Policy of the United States.**" Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CUILIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention. Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Ment By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Ment By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet First Honorable Mention, 1907. By Lieut.-Comdr. Yate U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By der Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall W It for Battle? Second Honorable Mention, 1908. By L mander Yates Stirling, U. S. N.

1909.

Some Ideas about Organization on Board Ship. Prize Essay, Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. B dore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorabl 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Me By Commander A. P. Niblack, U. S. N.

1910.

The Merchant Marine and the Navy. Prize Essay, 1910. By N structor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorabl 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911.

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charl U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradle U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Comma Marsh, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-eighth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute. by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1911.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1912. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.

Vol. 37, No. 2 June, 1911 Whole No. 138

United States Naval Institute
Proceedings

PUBLISHED QUARTERLY
EDITED BY PHILIP R. ALGER

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Professor PHILIP R. ALGER, U. S. Navy (ex-officio).

UNITED STATES NAVAL INSTITUTE PROCEEDINGS.

Vol. 37, No. 2. JUNE, 1911. Whole No. 138.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FIELD OF WORK TO BE FILLED BY A NAVAL WAR COLLEGE.

By Captain William L. Rodgers, U. S. Navy.

The Necessity of Instruction in the Art of War.

1. The methods of preparing for war have changed very much in the last century.

In the eighteenth century, during peace, armies and navies were maintained on a much reduced footing and acted as police. Armies garrisoned the country and maintained order, while navies suppressed piracy, protected commerce and enforced navigation laws, but neither armies nor navies were kept ready for war.

When war was declared the belligerent powers recruited their forces with more or less deliberation and hostilities usually began on a small scale. As the armed forces ashore and afloat increased, a series of secondary operations gave them some experience of war and developed leaders, until at last in the second or third year of the war the belligerents began to exert their full combatant strength.

Except in Prussia, preparation for war in time of peace did not occupy a prominent place in the military and naval administration of the time. Governments were satisfied to train their leaders in war by the costly and bloody process of war itself.

2. But all this was changed by the example of Prussia after her reverses in the Jena campaign of 1806 and the consequent humiliating peace.

Then began the modern development of the nation in arms in the attempt to have the military forces ready for the greatest effort immediately after the outbreak of hostilities, and later, navies began to follow in the same direction of early readiness.

Thus during the past century the great changes in the manner of making war have been two-fold. The mechanical changes in weapons, as we all know, have altered tactics, but further, the antecedent preparation for war has been developed to such an extent by the great military nations that a few days' notice enables them to utilize the whole armed strength of the nation and strike their heaviest blow at once.

3. War deals with both physical and moral factors and is directed by experience and intelligence; and all those points must be considered in the preparation for war.

To the physical side belong the preparation and accumulation of men and materiel, their organization and administration.

To the moral side belongs (among other factors) the development on the part of the leaders of a readiness of mind to confront warlike problems in contradistinction to that peaceful attitude of the mind and temper fostered by years of administrative activity only. Finally the preparation for war involves the accumulation of personal experience of war (so far as may be) by various forms of study whose bases and methods rest upon the collated experience and data of actual warfare.

In our country, as in others where the country makes no special point of maintaining its armed forces in a high state of readiness for war, the accumulation of men and supplies, the development of suitable organization and methods of administration, the change of mental attitude of the leaders from a peace to a war standard, and the acquirement of warlike experience all take place after the outbreak of hostilities. Our system of military administration is therefore about a century behind that of the most advanced nations. The provision of men and material belongs to the financial and supply side of the naval and military establishments; but all the other branches of preparation mentioned above are not physical, but moral and educational, and as such are proper subjects for a war college to deal with in time of peace, because during such peace, necessarily there can be no development of warlike experience. So to guide us aright, we must depend upon study and forethought to be ready for war, instead of waiting

upon costly experience to correct us, perhaps too late, after the war has begun.

4. War is a conflict of volition on the part of leaders no less than of physical strength and training on the part of masses, and characters molded, matured and petrified by the influence of long years of peace are unfitted to assume at once, or perhaps at all, the boldness, resolution and fearlessness of responsibility which general experience shows to be most successful in war.

To counteract the unfavorable influence of peace upon naval administration and character, it is necessary constantly to keep in mind the conditions of war and to work to the demands of these conditions. To maintain these conditions before the service and to assure them due influence in the development of the navy is the subject of the war college.

It should never allow itself to fall into the details of administration, since that would make it an executive office, but the principles of organization and administration of the navy and all its allied offices are proper subjects for discussion and recommendation by the war college, because during peace both organization and administration have a tendency to become cumbrous and unsuitable for war. It is a great part of the national preparation for war to have an administrative system working smoothly, if the nation is to develop its resources as quickly as modern conditions require, and therefore the war college should examine the system in use to see that it is satisfactory.

5. It is equally the duty of a war college to train and develop in officers the cast of character which is most suitable for war and for dealing with warlike conditions, so that when it comes they will not find themselves incapacitated by new conditions, which have never been contemplated; like a tourist from the sea level wandering in the mountains who falls exhausted more from the unaccustomed rarity of the atmosphere than from the severity of his exertions.

Every commanding officer, whatever may be his rank, either in the army or the navy, has duties of two distinct classes. To the first class belong those relating to the maintenance of his command in efficient condition, including organization, administration, discipline, training of personnel, and maintenance of materiel, both in peace and war. The duty of the second class is that of making and maintaining himself an efficient leader of the force under his command. The two classes of work are entirely distinct.

As an example of this classification of duties let us consider th case of a lieutenant commanding a gun division in which there i a life boat. As an administrator commanding the division he i responsible for the drill of the crew and the equipment of the lif boat, and he must see that all the points in the management of life boat as described in the seamanship manuals are duly attende to. In this way he provides the ship with a life boat able at th order to perform efficiently the duties to be expected from it. Bu this is not the only duty connected with the life boat which th young officer must perform.

As opportunity occurs, by study, experience and reflection, h must prepare himself as officer of the deck, that is, as a leader, t decide promptly, when occasion arises, whether the circumstanc justify him in lowering the life boat and how he may best lay th ship to facilitate the work and promote the safety of the boat.

On a larger scale, a commander-in-chief has the same class fication in his duties. On one hand, as administrator, he mai tains his fleet in a well drilled, efficient condition in all its depar ments, ready to execute any order which it may receive. On th other hand he makes and maintains himself an efficient leade able to use with decision and to the best advantage the weapo which he forges.

These two classes of duties are entirely distinct. A man may d either well and not the other, or he may do both well. As a example in the British Navy, a century ago Lord St. Vince formed the British Fleet with which Nelson won the battle (Trafalgar. The gifts of St. Vincent were supreme in one dire tion, those of Nelson in another. In our own country, and i more recent years, General McClellan organized and trained tl Army of the Potomac with remarkable success, but could not : use it to crush a much weaker enemy, and was removed from tl command when the President recognized his limitations.

When Grant succeeded to the command of this same army, l had never shown any faculty for organization or administratio but taking as he found it, the admirable instrument which tl President placed in his hand, he used it with such vigor as to en the war.

The duties of maintenance fall alike to commanding officers c all ranks, both in peace and war, but the opportunities of leadershi within their spheres occur more often in peace to officers in th

lower ranks than they do to those in the upper ranks, and as a result junior officers are practiced in all the duties of such ranks and are well versed in them. As a consequence, we are apt to think that having done well in the lower ranks is a guarantee that a man with years of experience in the navy will do well in all his duties in the upper grades. But really such is not the case with regard to the duties pertaining to leadership.

There is a fundamental distinction between all duties which are habitually done in peace, such as those of administration and maintenance, and certain duties of leadership which frequently fall to junior officers in peace, and on the other hand those duties of leadership which occur only during war. In peace it is the duty of every one concerned to aid the commander. The only obstacles to be overcome are those of inanimate nature, such as the weather, and deranged machinery. But from all the people that he meets the commander expects nothing but cordial assistance. In war, however, all is changed; then for the first time the commander finds an active intelligence opposing his efforts, deceiving him, and thwarting his intentions at every turn. The experience is absolutely new, and when to this complete novelty is added the tremendous responsibility of war, it is nothing strange that most people fail under the strain.

It is with these duties of leadership in war that the war college is chiefly occupied. We are all familiar with the sub-caliber methods by which gun-pointers are trained, and the analogous procedures which are applied in training for many other lines of business and sport.

The object of all sub-caliber training is to practice the mental or physical processes incident to the fully developed action, whatever that may be, at a reduced expenditure of time, effort and cost.

By such sub-caliber exercises the appropriate processes become more or less automatic under the control of the lower brain centers, and finally we do a thing right because we know how, rather than because we give great concentration of thought or mental effort to the matter in hand.

It is then the business of a war college to exercise and train officers in the art and duties of leadership as distinct from those duties of administration and command which they learn elsewhere.

In both classes of duties which fall to a commanding officer, those of leadership and those of command, he needs help and is

furnished with a staff through whom he executes his plans. members of his staff who aid him in his duties of leaders known in military phraseology as the general staff, an whose duties lie in the direction of administration, sup training of the command belong to the routine staff (as t mans say).

Thus on a staff of a commander-in-chief of a fleet the d a fleet intelligence officer are those of the general sta his duties have reference to the enemy and the commander as leader, whereas the fleet engineer and the fleet surgeon to the routine staff as their duties have reference only to t efficiency of the command and not to the method of its use. theless, should a member of the routine staff be called upon upon some question relating to the use of the combatant f is then engaged in general staff duties. For instance, general commanding an army asks his surgeon as to the healthfulness of two alternative lines of advance for the ar latter's reply is general staff work. Later, when in view o conditions the route has been selected and the surgeon is to prepare sanitary rules for the march, he is performin belonging to the routine staff.

THE FIELD OF WAR COLLEGE WORK.

6. It is particularly the duty of a war college to incul art of leadership.

This duty of a war college to keep the methods and st of war before the leaders of the service is a part of that preparation for war while yet at peace whose development to Prussia. On the other hand, the whole of preparation is a matter for the consideration and study of the war This development of peace preparation and consequent re as the basis of a successful war includes the following br

(1) The organization and training of reserves for aug the armed forces.

(2) The accumulation of sufficient warlike material in ness.

(3) The accumulation of military information and dat

(4) The preparation of plans of campaign.

(5) The training of battle leaders (or in other words, quirement, as well as may be, of warlike experience in peace).

(6) The training of character to meet the demands of war.

Of these six branches the first two are administrative and executive in their functions and only the organization and results of the work of the departments dealing with them are proper subjects for the consideration of a war college, which should never burden itself with administrative details of any part of the service administration.

The second two branches form another group closely allied to each other, and to the work of the war college, but at the same time quite distinct from the third pair, which last are matters of education to be dealt with after the manner of other educational subjects, and, being directly educational in their nature, they are particularly the field of a war college.

7. On the whole we may say that the war college has three distinct duties, which, nevertheless, are allied.

The first duty is to develop the art and science of naval war by study and research.

The second duty is to train and develop the individual officers to fit them to assume the responsibilities of command in war.

But in carrying out this second duty by setting concrete problems before individual officers for their instruction, it will often be convenient to take up questions of general naval policy. Solutions of such questions are then available for the information and guidance of the Navy Department.

The naval war college finds its third duty in thus aiding the general board and the division of operations in the study of those matters which are particularly the duty of the latter.

While these three duties of the college are quite distinct, yet the first two are so allied that it is quite possible to carry them on together at the same time and by the same methods. As for the third duty, it is self evident that men who have done most to improve their individual capacity for war and who have most deeply studied war, are, other things being equal, those who are best fitted to discuss and lay down the general policies of the Navy Department from a military point of view, that is, to act as the general staff of the Navy Department.

It follows therefore, that when people are sent to the war college it is preferable that they should first study war for their individual improvement and not till afterwards should they study to solve the problems of the Navy Department.

THE FAILURE OF OTHER PROFESSIONAL SCHOOLS TO OCCUPY THE FIELD OF A WAR COLLEGE.

8. After the foregoing sketch of the general field of the higher professional duties it is appropriate here to glance over the present educational methods of our navy and see how they fit our needs.

To train our officers we have a naval academy where prospective officers are given general education, as well as courses in the technical branches belonging to the sea, to naval mechanics and to naval drills, but the academy makes no pretense to teach the conduct of war.

After graduation the midshipmen practice those branches of their profession which relate to the safety and efficiency of their commands, and the examinations at promotion are assumed by the authorities to direct postgraduate study in desirable directions. But here again little or nothing is done to promote the education of officers in war, as distinct from maintenance.

Further, there are certain postgraduate schools which teach some technical branches of the naval business, but these branches deal with problems of mechanics and physics; with maintenance rather than with war.

Finally, we come to the war college which is concerned chiefly with the art of war, but with other professional branches only as subordinate to the art of war.

Let us now review in a little fuller manner how these different schools and examinations of the navy educate and instruct.

Every profession embraces a science and an art. The science deals with principles, with the accumulation of facts, and with history. Its end is solely knowledge.

The art deals with the application of the science to concrete cases and its object is the accomplishment of useful work. The science is only a preliminary acquirement by way of secure foundation; the art is the object of all professional education.

In former times education was held very nearly to cease with the acquirement of science, and the art of a profession was picked up haphazard by undirected practice. Recent development has brought the practice of the art of most professions more within the domain of formal education and the usual method of instruction is that of dealing with concrete cases under skilled criticism and direction.

A century ago naval education left much wanting and our naval academy was founded to give a sound education to young officers,

but the professional branches covered at the academy teach only the technique of arts subordinate to and allied with naval war, as the arts of seamanship, navigation, engine driving, gunnery, etc., and in these branches not only the science is taught but the art as well. All these relate to maintenance, but of warfare nothing or next to nothing was or is taught.

When we come to postgraduate examinations as a means of enforcing officers to acquire and maintain an education, we find that the subject of war is introduced into the naval curriculum; but while the examination in each subordinate branch is conducted not only as an inquiry into the candidate's knowledge of the science, but also as to his ability in the art; in the subject of warfare, the examination is in the science only, to the neglect of the art.

Thus in navigation, the examinee may be told to explain Mercator's projection, which tests his science, but he may also be told to work a time sight, which is a trial of his art.

But in an examination in warfare it may be asked "What is a line of communication?" which touches the science of war, but an officer is never told "Under such and such conditions, choose a line of communication from the United States to the Philippines," which would test him in the art of war.

Therefore, we cannot hope that examinations as at present conducted in naval tactics and strategy will do anything to improve our conduct of war when the time comes, for the reason that such examinations test the examinee's memory only, not his skill. As Medical Inspector Beyer pointed out in a recent lecture at the war college dealing with skill in war from a biologic point of view, art is to be acquired only by practice, and we must constantly practice the forms of mental activity which arise in war in order to reach success through making the necessary mental processes more or less reflex by constant practice. Reading and scholarship alone cannot form a successful leader in war, and the duty of a war college is to afford opportunity for practice in the mental exercises of war. The army endeavors to afford to its officers this practice of war in various forms. For example, in an examination for promotion the examinee has actually to handle a battalion or a regiment: He is taken out in the field and demonstrates his ability there.

Of course, such a demonstration is not proof of one's fitness for one's profession, but it may demonstrate unfitness, and in so far it is good.

THE ARMY METHOD OF TEACHING THE ART OF WAR.

9. In the military profession, Prussia was the first to undertake formal instruction in the art of war, as distinct from the science, and the method used was that of dealing with concrete cases of war; a method now common in many other arts and professions.

In the application of this method to the art of war it is recognized that practice and experience are essential and that thoughtful criticism of a performance is always a great assistance to the next attempt. But in war the school of experience is seldom open and a substitute is necessary in time of peace.

This substitute is found in the study of history conjointly with desk solutions of proposed plans of campaigns and fleet maneuvers and is best applied through the more recent developments of the Kriegspiel or "war game" under the title of "map problems" and "map maneuvers." The object of both these forms of exercises is to teach the art of command through practice in strategic and tactical situations in war. Through them, officers taking the course become acquainted with the lessons of history and make these lessons their own.

In the "map problem," a situation is offered for solution and the student lays down a plan for dealing with it. The first step is to measure the situation. The estimate, analysis or appreciation, as it may be termed, of the situation includes a selection of an objective; a consideration of the strength, distribution and the relations of time and space between the forces at the disposal of the student and those of the enemy; and finally a decision as to the course of action by which to reach the objective.

The second step is the formulation of the order to carry out the decision. In the form of this order there are usually five general parts. First, information as to the enemy and friendly forces cooperating with the commander issuing the order. Second, the general plan of the commander. Third, the specific orders to the various subordinates in charge of combatant forces. Fourth, directions for the non-combatant organizations and supply services. Fifth, information as to the personal whereabouts and intention of the commander.

In thus following a set form, the individual drawing up the order clears his mind by adhering to a logical sequence of ideas, and is less liable to make errors; by sending an identical order to all his subordinates, his mental processes are simplified and all the subordinates understand the whole plan better.

When each member of the class has thus solved the map problem, the solutions are compared, analyses made, and on a subsequent date a conference is held upon them, and the chairman of the conference, in pointing out errors, differences, is able to give and does give such advice and instruction as seem suitable. Through such work the college develops a school of thought of the greatest value in time of war. In war, when commanding officers know each other to have been brought up to hold similar strategic and tactical views, and unforeseen conditions arise, their independent action will be such as each can foresee of the other, and such confidence is of the greatest support.

10. Having taken a course in "map problems" the next thing is a course in "map maneuvers." The "maneuver" differs from the "problem" in that it is a continuous contest between two sides instead of being a study of an isolated situation by a single mind. In the "maneuver" the commander of each side forms his plan and issues his orders as in the "problem," distributing the subordinate parts as he sees fit.

The contest is then carried on through its successive phases on the map, a record being made of the course of events.

In the map maneuver there are two sides with an approximately equal number of subordinate players all working under umpires. In the naval map maneuver as it has been played at the naval war college there has been an increasing complexity and slowness in the game, which arises from several causes, but which may be reduced in considerable degree by a systematic method of dealing with the subject.

In the map maneuver, the object is to make the participants acquainted with the theory and practice of war and to develop the art of command and the growth of military character in war by confronting the participants with the necessity of passing promptly and correctly upon situations as they arise.

The only things that are real in the situation in these maneuvers are the decisions made by the participants upon the situations presented to them, but these are comparable in all respects to similar decisions made in war except in regard to the gravity of the results; for these suppositions are necessarily unaccompanied by physical conflict, bloodshed and the development of the various moral forces and effects which play such important parts in war.

When in the solution of a map maneuver one of the contestants forms a resolution, although it is a real act of war, the conse-

quence of such a resolution in war would be in some physic situation, such as a movement of forces, or a battle, whose soluti would lie in the action of the combatant forces. In the m maneuver, however, there can be no physical outcome to t resolution of the player and the situation immediately becom unreal. In this dilemma recourse is had to the umpire, wl refers to his knowledge of history to select a situation similar the one which has arisen in the maneuver and then renders probable solution based upon the case of actual warfare as governing precedent. The umpire thus having cleared the groun the way is open for the contestants to form new resolutions a thus the action moves on to another phase to be solved by a ne appeal to the umpire for a solution of the situation based on t history of actual warfare. In this way, the student is led to expe ence in his own person that part of the conduct of war whi relates to the moral conflict of the leaders, and by such experien his character is braced to meet the responsibility of commar At the same time, the constant reference to history to learn wh result may be expected from his resolution makes his conclusio sound, gives him a training in war second only to experience actual war, and makes the course of study practical in the high degree.

As was said previously, these sub-caliber studies in leadersh in war are as profitable to commanders as sub-caliber firing is gun-pointers. For thus a student makes a great part of the art war his own. The remarkably successful results which follc from studies so prosecuted and the disasters which follow the neglect are evident in contrasting the progress of the two gre wars of this century (Boer War and Russo-Japanese).

THE METHODS OF THE NAVAL WAR COLLEGE OF TEACHING TI ART OF WAR.

11. Let us now see what is done by our naval war college improve our conduct of war. When the college was first esta lished it dealt only with the science of war. Captain Mahai lectures on Naval Tactics and Strategy established for the fi time the science of naval warfare on a sound basis. This w much, and when his works were published as naval histories th were appreciated by the whole civilized world; much more inde abroad than in his own country.

With this accomplishment the war college rested for some years until under the presidency of Captain Taylor it undertook to deal with the art of naval warfare by adopting "Kriegspiel" from Germany and modifying it to meet naval requirements. But at that time the staff of the college was not prepared to instruct. The work of the students was unguided, for both they and the staff were groping in darkness together, the blind leading the blind. Accordingly progress has been slow. Nevertheless, at the present time some progress has been made; certain points in naval warfare have been definitely cleared up. Besides, it is now recognized, just as Mahan pointed out in his lectures with regard to the science of war, so also in regard to the art of war, much work done by the army is available for use of the navy.

Hitherto the war college has said to those attending its courses "find the path for yourselves," but all the considerations just mentioned show that it is now the duty of the college to avail itself of the standing it has gained in past years, to point out the proper path of progress and aid people to walk in it. The next step in the development of the war college is to assume authority and teach.

DOCTRINES WHICH SHOULD BE THE FOUNDATION OF INSTRUCTION IN THE ART OF WAR.

12. For many years Germans have been teaching their army two great doctrines, the doctrine of "offense," and the doctrine of the "initiative." These two doctrines are just as necessary in naval warfare as in land warfare and evidence is not lacking that the German navy has been as thoroughly imbued with them as the army. It is the more necessary for these doctrines to be systematically taught to the naval service because the influence of peace routine opposes their growth and development in the mind and character of officers.

The doctrine of the "offense" which the Germans take such pains to inculcate is the result of much experience of war and much study of military history. In war, there is both attack and defense; and each student is made to recognize that while defense is the stronger form of warfare, it is merely negative in its results. An attitude of defense is properly taken up only to delay the enemy and allow conditions to change until there is a prospect of successful attack. If a combatant expects to remain permanently on the defensive, peace at once is better and less expensive.

On the other hand, offense is the weaker form of warfare but it is positive in its results. If one is strong enough to attack he expects to gain something by his battle. Even in a defensive battle, if the defender repels the attack, he cannot profit greatly by his repulse of the enemy, except by passing to the offensive.

Thus the doctrine of the offensive is that only by attack at some stage of the strife (war or battle) can real success be won.

Nothing else is effective, yet after long peace the outbreak of war is apt to find leaders who, not having had proper training during peace, seek success by some other means than attack, who try to defeat the enemy by stratagems, deceit, maneuvers, or any other means which refrain from bloodshed.

The doctrine of "offense" teaches that such pitfalls are to be avoided and that ultimate success is only to be found in striking the enemy. This lesson is one the German army has learnt and teaches as the result of profound study of history, and the military world accepts it as true. Although we know less of German naval views, yet what we do know warrants the belief that in the navy also the same doctrine is based on the facts of naval history.

It is necessary for a naval war college to teach the doctrine of "offense," for if we look at the early records of "strategic situations" as solved by officers attending our naval war college, there is abundant evidence to be seen in them that the doctrine is not a matter of intuition.

If our training for war is to keep pace with the most advanced nations our war college must never relax its effort to teach this doctrine and impress it on the characters of naval officers.

13. The doctrine of the "initiative" is the second great German doctrine of war. While the usual meaning of the word is the starting or beginning, in the military technical use it has two shades of meaning.

As between two hostile forces, the initiative means the beginning of a course of action on the one side, while the other side remains in a state of expectancy.

As between a commander and his subordinate in the same force, initiative refers to the duty and privilege of the subordinate to begin a course of action without specific reference to his superior. This is so contrary to the usual idea of military discipline as exemplified in the familiar gospel story of the Roman Centurion and the soldier that it calls for clear explanation.

The military art calls for the highest degree of cooperation between man and man to secure success. Discipline and formation of character to ready obedience have always been the recognized means of obtaining such cooperation. But this literal obedience is desirable only where the commander is actually present at the point where the order is to be executed and cognizant of existing circumstances, and usually it is less necessary the larger the command of the subordinate.

If conditions change between the issue of the order and its execution, it may no longer be advantageous to proceed with it, or suddenly arising circumstances may require a subordinate to act without instructions. In either case, opportunity occurs for initiative; by which is meant acting according to the general plan of the commander rather than according to the exact letter of his instructions. This is the highest form of cooperation. It is not license for the subordinate to do as he likes, but calls for entire loyalty to the commander and is possible only to subordinates who are completely informed as to the general plan of the commander and their own part in it. But as it allows freedom to the subordinate, so it demands responsibility from him and is compatible with and indeed requires a high state of discipline to yield its greatest value. It is most necessary in the highest commands. In the lowest ranks initiative is least needed because the immediate superior sees the same facts at the same time, and can decide for himself as to the proper course.

Thus "initiative" is a question of the interpretation of orders; and consequently, of the formulation of orders, since they must be so framed as to give subordinates both the necessary information and the necessary latitude to meet the situation intelligently. In teaching "initiative" as a part of the military art, the army relies largely upon the formulation of orders to meet specific situations known as "map problems." In solving such map problems, the student first makes a thorough analysis of the situation which serves to develop his plan and then he formulates his order to convey necessary information, explain his resolution and assign to each subordinate his part in the general plan. All orders so drawn up are then carefully examined and compared to expose omission, superfluities and errors, and the class then undertakes to discuss and compare the various solutions in order to satisfy themselves as to what the proper course of action really

is. When an officer can formulate a sound order he has made a long step in the art of leadership, because to write a good order, he must first study the situation and form a plan suitable to it, and then he must communicate his news and decision to his subordinates, yet the order must not limit the proper discretion of subordinates by entering into unnecessary details and so hamper initiative.

The German army has originated a form of field orders which has been imitated by all the principal armies, which form confers upon subordinates the proper opportunity for initiative. The map problems which furnish the occasions for these lessons in initiative also call forth the proper views on offense, and in each case it is the due formulation of orders and their subsequent comparative criticism which gives the lesson.

It is an easy matter to adapt these map problems to naval use and make them the means of teaching the navy the same essential doctrines of the "offense" and the "initiative."

Not until after students have thus learnt a first lesson in initiative and offense by map problems does the army find it profitable to go further on the same road by exercises in "map maneuvers"; where, after formulating orders suitable to the situation, the students proceed to develop the action by the progressive contact of mind against mind, which in the navy we still call a "war game" after the German fashion. It is scarcely necessary to urge that this orderly development and progression of instruction which the army finds most advantageous promises as much for the navy, and that here also it should adopt and adapt the army methods without the labor and delay of originating and developing others for itself.

We are much behind the army, however, in our accumulation of tactical, strategic and administrative data in a form suitable for use in map maneuvers. As was remarked just now, in this form of maneuver, it is the duty of the umpire to solve each physical situation arising in a maneuver in a way which both contestants acknowledge to be possible and practicable in war. If the time required for the solution of a map maneuver is not to be very long, the umpire must have at hand actual precedents of every sort to guide him, if not to govern him in his decisions.

We may procure these from three sources, first from history, second from practical work of the fleet in its current drills and

maneuvers, and thirdly from the college solutions of minor situations on the tactical "map maneuver" table. But this third method itself is of course based on the other two, so that the war college work is based on the study of history and of our own fleet.

If its conclusions are not sound, the fault lies in the workmen, not in the materials and methods.

But the development of the "initiative" as between two opponents is also a matter of German solicitude. In this sense it is a part of the general doctrine of the "offense" and broadly means either surprise or striking before the enemy has completed his preparation.

The whole German plan of mobilization is intended to secure the advantage of "initiative" by mobilizing first and gaining the advantage of material and moral success at the outbreak of war. This the Germans did in 1866 and in 1870, and this they believe themselves able to do to-day, not only with their army, but with their navy also. The whole of "initiative" is to support the "offense," by instant continuous exertion of all the powers of the nation, and by all the component parts of the national armed forces. This generally accepted view of the advantage of the "initiative" is one which our government and people have never been able to take; and to those who have studied the matter it is the most threatening danger point whenever we are confronted with war. It is the duty of the war college to see to it that at least the navy understands all the advantages of the initiative and the offensive and profits by them to the greatest extent possible.

THE TWO SPHERES OF WORK OF THE NAVY DEPARTMENT AND THE RELATION OF THE WAR COLLEGE TO EACH.

14. It has been already mentioned that a commander has two main duties—to make his command efficient as a weapon, and to make himself efficient as a leader and wielder of that weapon.

The Navy Department similarly has two duties to perform; administratively it must maintain an efficient navy through its technical bureaus, and tactically and strategically it must use that navy effectively through its office of operations. The staff of officers who perform the duties connected with the employment of the navy as distinct from its maintenance form the general

staff. For some reason the name is objectionable to many persons in the navy, but nevertheless the duties must be done and the meaning of the term general staff is well defined. Perhaps some such term as " war staff " might be more acceptable to those who are prejudiced against the term " general staff " to denote those who perform these very necessary duties.

In the execution of the problems connected with the navy it is best to employ those who have studied the duties of leadership at the war college.

To emphasize what was remarked a few pages back, the duties of a war college are to hold the methods and standards of service necessary for the successful prosecution of war constantly before the leaders of the navy. As the work of this war college has developed in the course of years, it accomplishes this work along two different lines.

One objective which it undertakes is to aid the Navy Department as an organization in arriving at correct solutions of the various questions of policy relating to war, with which the Department is confronted. The individual officers of the Navy Department are overwhelmed with administrative details of work and they have little time available for consideration of broad questions of policy. The war college is unembarrassed by the necessity of dealing with administration and is free to devote itself wholly to questions of policy. Its work and that of the general board under the Division of Operations bear the same relation to the administrative work of the Department that a drafting room in a manufacturing establishment bears to the shops. The work of the shops is laid out in the drafting room and different shops work in harmony because the work of each has been coordinated by the drafting room with that of the others. Similarly, the war college considers the necessities and possibilities of war in solving the questions which are usually submitted to the conference of officers there. It works out its views by the study of history and by map maneuvers and by discussion of the experience of its own members, and arrives at well considered solutions of large questions of policy which the routine staff of the Department cannot well manage in regards to organization, supply, ship building, etc., on one hand and in regard to war plans, theaters of war, and bases therein, on the other hand.

The Department's duty of maintenance is administrative. After the division of operations has determined the requirements of war in various directions mentioned above, the other bureaus and offices of the Navy Department should convert the suggestions of the former into reality. But the condition of harmonious cooperation between the division of operations on one side and the executive bureaus of the Navy Department on the other is that neither shall trench upon the business of the other. The war college is in part an instrument for the study and elucidation of the questions of leadership which come before the division of operations. The war college in its academic studies formulates the requirements of successful war; the executive bureaus of the Department should conform to the doctrines of the war college after approval by the Secretary.

The bureaus should not revise the doctrines and principles of the war college, neither should the war college criticize the executive methods employed by the bureaus in filling requirements.

USE OF WAR COLLEGE WORK FOR PURPOSES OF THE GENERAL STAFF.

15. Although the object of a war college is to develop and train individual officers and acquaint them with the art of war, yet any work or study whose principal result is to develop this knowledge of the art of war is properly war college work, even if done away from the actual institution.

On the other hand work whose object is to afford a basis and guide for departmental policy is general staff work. But much work done originally as war college work needs only approval by proper authority to become available as general staff work.

A war college and a general staff are both concerned with four general branches of study; namely, economics, logistics, strategy and tactics. The last three are widely studied but the first receives less attention. Economics may be defined as the relation of national military forces and their needs to the commercial life of the nation.

For the regular army and navy the problems of economics are satisfactorily solved in one way or another for every country. The very continuance of the army and navy prove it, and it is for this reason that economics attracts little attention in minor military studies.

But as soon as mobilization takes place, and the regular services are required to expand to a war footing a whole host of economic questions relative to recruitment, armament and supply immediately arise whose correct solution is one of the first importance, and upon all these turn all the problems of the general staff. Any complete war college course therefore involves a study of military and naval economics, in order to form officers capable of solving general staff problems, i. e., problems whose solution is necessary for the guidance of departmental policy.

16. The steps taken at a war college to instruct officers in the art of war are several in number. They include preparation of monographs on subjects of military interest, the preparation and solution of map problems, the execution of map maneuvers, the execution of maneuvers on the ground with imaginary forces, and the execution of maneuvers with actual forces. (Of these, maneuvers on the ground with imaginary or indicated forces are practicable for the navy only in rare cases, when operating jointly with the army.)

But operations of war are of varying degrees of magnitude from those of the smallest units up to national wars, and in a course of study in the art of war it is very desirable to begin with a study of operations of the smallest magnitude, and advance progressively to deal with larger and larger magnitudes ending with the study of national war.

It is possible to classify operations of war approximately according to their magnitudes.

Thus, the only operation of the first magnitude is national war embracing the combined operations of the national army and the national navy.

In the second magnitude we may put:

a. Operations of the national army.

b. Operations of the national navy.

c. Combined operations of two or more forces of the third magnitude.

In the third magnitude we may put:

a. Operations of several army corps.

b. Operations of several naval squadrons.

c. Combined operations of two or more forces of the fourth magnitude.

And so we may continue, bearing in mind that in the smaller

magnitudes the classification of operations falling under each may be indefinitely extended at pleasure.

In the study of operations of any magnitude the first step to be taken is that of the preparation of monographs embodying necessary information in regard to the class of operations under consideration. It includes the study of history and of maneuvers and the accumulation of all possible information in regard to the operation to be undertaken, and as every operation is composed of a related series of smaller ones it is clear how necessary it is thoroughly to understand minor operations before dealing with larger ones. In operations of the larger magnitudes the monographs embody most careful studies from every direction of all the problems of economics and logistics relating to war. Such studies in economics and logistics form the necessary foundation of further war college work in map problems and map maneuvers of the same magnitude and are besides the foundation of general staff plans for mobilization and conduct of national war.

Information in regard to operations of the smaller magnitudes which should be formally embodied in a monograph is frequently assumed to be a part of the ordinary professional knowledge of every officer.

After the monograph has been prepared, or its necessary information assumed to be known, the next step in studying a given operation is the solution of a map problem relating thereto which involves the preparation of plans to meet the situation.

By the study of a series of map problems, the mind of the student is formed by practice not only to plan but to command. The map problem is an instrument whereby one learns to formulate his orders with necessary precision but yet with due regard to the sphere of action of his subordinates, and with proper allowance for unforeseen contingencies.

In the map maneuver the student takes a step in advance and exercises his mind against that of another, learning to modify his plan and his action according to conditions as they arise.

In maneuvers on the ground with imaginary forces, the student first passes from desk work and begins to train himself in the observation of actual conditions and circumstances in so far as they relate to the terrain, but otherwise these maneuvers are similar to map maneuvers. The study of terrain by this form of exercise is practicable for the navy in occasional situations only and then usually in conjunction with the army.

Finally, maneuvers with real forces give experience in actual handling of forces, train the eye in estimating the situation, train the judgment in dealing with men, and give to the participants an actual knowledge of a great proportion of the circumstances and conditions existing in war.

17. Let us trace the work necessary in carrying out a map maneuver of the first magnitude. Such a map maneuver when carried out by experienced officers is general staff work. That is to say, the solution of such a problem will be the basis of departmental administration and strategic plans for war. The situation for opening the maneuver will be as follows:

State A desires to assume the offensive against State B, and begins the mobilization of fleet, army and over-sea transport service on date X. State B begins its mobilization on date Y.

The first step is to draw up a series of monographs on the strength and characteristics of the forces of the two enemies and the economics of the two countries, wealth, resources and reserves of military and naval supplies and of men trained and partially trained. A further series of studies is to be made of the dates X^1 and Y^1 at which the two powers can complete their respective mobilizations. A still further study must be made of the logistics of the national forces to determine the relative times at which the various constituents of each national force can reach different theaters in which the objectives of one side or the other are likely to be found.

Having completed the studies for information, it is next in order to take up a series of map problems to compare a series of plans as well as to instruct individuals.

Thus: State A having a force P completes its mobilization M days before State B completes the mobilization of a force Q. A's objective is R. Draw up general letters of instruction for the campaign of A, and afterwards for that of B for several variations of M, P, Q and R.

18. When several of these plans have been worked out people are sufficiently acquainted with the general subject to proceed with map maneuvers carrying the study a step further.

The contestants make and follow their plans until the hostile forces come in contact, when a local situation immediately develops of the second or third magnitude. If the umpire and players are all well acquainted with conditions arising in local situations of

such a magnitude, it is satisfactory to deal summarily with these local phases of the progress of the maneuver by arbitrary decisions of the umpire based on the general confidence in his knowledge as well as in his judgment. In such a case the map maneuver remains in reality one of the first magnitude, and is a study of the strategic relations of various important operations which make up the whole conduct of a national war. On the contrary, if in the conduct of a maneuver of the first magnitude the umpire and players are not already familiar with operations of the second and third magnitude, it is useless for the umpire to carry on the situation by arbitrary decisions in which nobody, not even himself, places any confidence. To give instructive results in this case it is necessary to deal individually in detail with every local contact, and while nominally a study of an operation of the first magnitude the maneuver is actually degraded into a long series of maneuvers of minor magnitudes which are in themselves valuable but are fatiguing and lose much of their instructional value because everybody realizes that they are not what they pretend to be—a study of the first magnitude. We cannot carry the study of an operation of the first magnitude futher than a map maneuver, as real maneuvers on such a scale with real forces are totally impracticable except in war.

REVIEW OF THE METHODS AND RESULTS OF A WAR COLLEGE COURSE.

19. Enough has been said to indicate that in the systematic study of war by the methods now in vogue it is necessary to begin with operations of the smallest magnitude and complete the study of that magnitude before passing to the study of a greater magnitude. However, if it is sought to omit a magnitude in this progressive study, it will be found that no increased progress is made; because when a local situation of the omitted magnitude occurs as a minor event in the general conduct of a large operation it will be necessary to suspend the rest of the study in order to examine in detail the minor phase with which nobody is acquainted.

The present map maneuvers as carried out by the army are an improvement on the naval war game because the former are much more rapid and flexible.

The early form of Kriegspiel to which our navy still closely adheres involves a group of players on each side working by a set of rules, governing each imaginable circumstance. By the help of the rules the players move to a solution through an infinity of detail, but the amount of work in large problems becomes prohibitory, even to German thoroughness. A satisfactory modification has been found to be in the substitution of the learning and intelligence of an umpire for the dull and tedious inflexibility of rules, and modern Kriegspiel is no longer a "game" of war because fixed rules are absent. It has become a "map maneuver," but the less the umpire knows of the history of war, the more tedious is the maneuver and the more it reproduces the objectionable features of the early form of Kriegspiel. From the map maneuvers of a given magnitude we pass in the course of study to field maneuvers, first with imaginary and then with real forces. (With naval forces only, the map maneuver with imaginary forces is ordinarily worth very little.) The maneuver with real forces is much slower than the map maneuver and needs more extended arrangements, but is has the great advantage of training the eye and judgment in recognizing the actual situations as they arise in service, whereas the map maneuver, although of very great value, remains a mental exercise only.

Having completed a series of exercises relating to operations of a given magnitude, it is then time to begin the study of operations of the next greater magnitude. The first step is the preparations of monographs embracing the necessary information relating to such operations. The data for the monographs are to be found chiefly in the history of war, but also in the records of map and field maneuvers carried out in previous exercises of minor magnitude, and having completed the monographs by all available information the course of study proceeds to map problems and maneuvers.

In this way a foundation may be gradually built up, so that the participants quickly grasp the essential points in any problems of war that is presented to them; but this promptness in apprehension depends upon the due and orderly sequence of study in which no step is omitted and full examination is made of operations of each magnitude before proceeding to those of the next greater magnitude.

20. When a war college course such as has been described has been completed, the student has accomplished the following in the way of individual professional development:

Through monographs he has acquired a fund of information in regard to war based upon the wide experience of many people, which is to be a guide to him.

In the war problems he has learned to formulate clear and sound plans of war; and in giving orders, to keep closely to his own business, leaving to his subordinates the duty and privilege of attending to theirs without disconcerting annoyance. Further, the map problems teach precision of phraseology and to convey the intentions of the leader without hampering the proper discretion of subordinates.

Further, the map problems, while primarily tactical studies, are also most desirable as studies in administration. In war, results depend upon the success with which subordinates execute the broad intentions of the commander-in-chief. The enemy is always seeking to frustrate his opponent's plans, and if the commander-in-chief embarrasses his subordinates with undue interference with their initiative and responsibility, he cannot have his ideas carried out. A good plan may fail because it is too rigid to endure to the end: The commander-in-chief's error in such a case is not tactical, but is an administrative fault entailing tactical results.

In the map problems such errors in the solutions are dwelt upon and the students not only learn to avoid them in tactical matters, but the influence of those studies bears fruit in better administration in all lines of work. The map maneuvers teach the student to pursue unhesitatingly, continuously, and, above all, promptly the course of action originally chosen upon sufficient reasons.

Further, the maneuvers on the ground or at sea train the eye and judgment in real movements, and put the capstone on the previous work.

The final result of a properly conducted war college course is that those who have profited by it are better fitted to solve the questions arising in the conduct of departmental preparation for war (general staff work), than they would have been had they not had the advantage of formal and regular instruction in the art of war, and the course of study has at the same time developed their capacity for assuming in their own persons the responsibilities of leadership which cannot otherwise be learned in time of peace.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ALTERNATING CURRENT *VERSUS* DIRECT CURRENT FOR USE ON BOARD SHIP.

By LIEUTENANT S. M. ROBINSON, U. S. Navy.

At first sight, it would seem that the advantages of alternating current disappear on board ship since the main advantage—that of more economical power transmission for long distances—does not hold here. However, the electrical installation of a battleship is such a complicated problem that it finds no parallel elsewhere, and it has to be considered in detail to determine which system is the better. In order to do this it will be necessary to enumerate the electrical appliances used on board ship, and also to consider the wiring of the ship.

The following list comprises most of the electrical appliances to be found on one of our new battleships:

4 300 K. W. generating sets.
2 500 watt motor generator sets for interior communication; voltage 16 to 20.
2 500 watt motor generator sets for telephones; voltage 16 to 20.
2 25 watt dynamo motors for telephone bells; voltage 75, frequency 16⅔.
2 1½ K. W. motor generator sets for turret danger zone signals; voltage 125, frequency 60.
2 Small motor generator sets for turret tell-tale system; voltage 20.
1 Small motor or motor generator set for the howlers.
1 5 K. W. motor generator set for wireless telegraphy; voltage 110, frequency 500.
Numerous ¼ H. P. ventilating sets.
4 5 H. P. jacking motors for turbine ships.
12 45 H. P. motors for forced draft blowers.
8 Motors for machine shop, ranging from ¾ H. P. to 7½ H. P.
The time firing device.
12 40 H. P. motors for the turret ammunition hoists.
12 3½ H. P. motors for breech closing.
12 10 H. P. motors for the rammers.
1 12 H. P. motor for the sanitary pump.

6 Small motors for use in the galley, ranging from ¼ H. P. to 2 H. P.
2 3 H. P. motors for fresh water pumps.
Fan motors for the ventilating system, ranging from 1¾ H. P. to 11 H. P.
2 40 H. P. motors for hoisting } For the boat cranes.
2 30 H. P. motors for turning }
7 35 H. P. motors for deck winches.
4 4 H. P. motors for fire room elevators.
17 ¾ H. P. motors for the long-arm system.
1 6 H. P. motor for the laundry.
14 3 H. P. motors for the chain hoists.
4 4 H. P. motors for the ammunition conveyors.
12 35 H. P. motors for turret turning.
12 15 H. P. motors for gun elevating.
Electric ranges of 190 H. P. and 380 H. P.
Electric bake oven of 20 H. P.
Search-lights taking 120 amps. at about 50 volts.
Incandenscent lamps.

The motors of the ship can be roughly divided into four classes:

(1) Those not requiring large starting torque, nor variable speed, but requiring good speed regulation with change of load. These are the motor generator sets, fan motors, portable ventilating sets, time firing device motor, small motors in the galley, laundry motor, turret training and gun elevating motors when equipped with Waterbury Tool Co.'s method of speed control.

(2) Those requiring considerable starting torque, but not requiring variable speed. These are the pump motors, motors for the long arm system, chain hoist motors, ammunition conveyor motors, and turret ammunition hoist motors when arranged to run continuously as they are on the new ships.

(3) Those requiring considerable starting torque and a speed falling off considerably with increase of load. These are the deck winch motors and elevator motors.

(4) Those requiring a variable speed, either large or small starting torque, and reversibility. These are the machine shop motors, hoisting and turning motors for the boat crane, rammer motors, forced draft blower motors, and jacking motors.

Let us take up this list in detail to see whether alternating current is suitable. The generators would be of the three-phase type, giving 125 volts as at present, and 60 cycles frequency. This frequency would be suitable for both motors and lights. The three-phase system would be used in preference to other poly-

phase systems as it gives a simpler wiring arrangement; the single-phase system is not flexible enough and is not adapted for all motors.

In a three-phase, 60 cycle, alternating current system, the motor, to fulfill the requirements of the four classes of motors used on board ship, would be the induction motor in some form, so an enumeration of its principal features and characteristics is given here. The stator of this machine is practically identical with that of the alternating current generator. There are two general types of rotors; the first is a simple drum with copper bars embedded in its surface and short-circuited by rings at the ends and is called the squirrel-cage type. In this form the induction motor is about the simplest known electrical machine. The second type is known as a definite or polar wound rotor; the windings are led to slip rings and then short-circuited through a variable resistance. There are several forms of this type but they all have the same general characteristic—that of a wound rotor.

For any given induction motor, the torque at starting varies directly as the resistance of the rotor; under running conditions, for any given speed, the torque varies inversely as the rotor resistance. With low resistance rotors, there is very little variation of speed with load, this being as low as one per cent sometimes; with high resistance rotors there is a wide variation of speed with load. The usual method of starting a small squirrel-cage induction motor is to connect it directly to the power mains; the method of starting a large squirrel-cage motor which does not require large starting torque, is to use an autotransformer in the primary circuit; this feeds the stator at first with a low voltage, gradually increasing this till full voltage is reached. There are two methods of varying the speed: first, varying the resistance of the rotor windings; second, changing the number of poles on the stator. This latter is generally used to give only two speeds while the former is used to give a great number of small variations of speeds. Reversing is accomplished by changing any two of the primary leads. When driven above synchronous speed the motor acts as a generator, tending to pump power back on the line, thus giving a strong braking action: the different forms of this motor adapted for the four classes of service required on board ship would be:

(1) For class one, a squirrel-cage motor with a very low re-

sistance rotor; it would have small starting torque, small slip, and high efficiency.

(2) For class two, a squirrel-cage motor with a higher resistance in the rotor windings; it would have a fairly large starting torque, variation of speed with load would not be considerable, and the efficiency would be fairly good.

(3) For class three, a squirrel-cage motor with a high resistance rotor; it would have very large starting torque, large slip, great drop in speed with increase of load, and low efficiency.

(4) For class four, a definite wound rotor, with variable resistance in the armature; it could be arranged to give maximum torque at starting; the slip and efficiency would depend on the amount of the resistance used.

Each of these motors would perform its duty in a perfectly satisfactory manner in every way. Those with high resistance rotors would be inefficient electrically, but they are only used intermittently, and for that matter, the direct current motors used for the same purpose would, as a rule, be inefficient. The actual performance of the work would be entirely satisfactory and most of the motors highly efficient.

There is another form of alternating current motor which would be useful for some purposes on board ship. It is a recent modification of the single phase series motor. It has a stationary armature and commutator which are just like those of a direct current machine in their relation to each other but the commutator is separate from the armature and may be situated any distance from it. The brushes on the commutator are supplied with single-phase alternating current and they are revolved, either by hand or by a small motor, thus producing a revolving and pulsating field in the armature. The rotor consists of a drum with one short-circuited coil on it. This coil keeps step with the brushes as they revolve. The action of the motor is practically the same as that of a transformer so that when the brushes are stopped, the current supplied to them will be very small, being only the magnetizing current. The amount of torque developed at starting will vary with the load; the speed will be independent of the speed of the generator and will depend solely on the speed of the brushes. The efficiency is slightly lower than that of polyphase motors and the power factor is higher.

This motor would be very suitable for a steering engine, since

it has the advantage that when the brushes stop rotating the motor becomes a generator, giving a very powerful braking action that is obtained in direct current machines only at the expense of considerable complications.

For turret work, it would be an ideal form of motor as it would be equivalent to hand training and elevating without any of the disadvantages of the latter. It would also have the advantage that it could be operated by direct current from storage batteries if these were installed in the turrets for an auxiliary power supply. If used in this way there would be two coils on the rotor and the second one would be short-circuited only when using direct current. The storage batteries would be charged from the power circuit through a mercury arc rectifier.

This motor could be used on three-phase mains without any difficulty.

Next consider the wiring of the ship. There are the power and light mains with the branches tapped off from them. The following smaller lines are also energized by generator voltage:

General alarm gongs.
Cease firing gongs.
Helm angle indicator.
Steering telegraph.
Engine revolution telegraphs.
Steering emergency signal.
Course indicator.
Ammunition hoist indicator.
Electric whistle operator.
Anchor handling and boat hour gongs.
Range and deflection instruments.
Spotters' information circuit.
Sub-operators' information circuit.
Bells and buzzers for salvo firing.
Gyro indicators.
Torpedo firing circuit.
Water-tight door signals.
Howlers.

The following lines are energized by motor generators:

Interior communication motor generators.
Call bells for voice tubes and staterooms.
Fuel oil tank indicators.
Fire alarm system.
Fire room and engine room telephone call bells.
Magazine temperature indicators.
Refrigerator room temperature indicators.

Telephone motor generators.
  Telephone circuits.
    Ship's telephones.
    Fire control telephones.
    Maneuvering circuit.
    F. R. and E. R. circuit.
Special motor generators.
  Turret danger zone circuit.
  Turret tell-tale circuit.
  Gun firing and sight lighting circuit.
  Gyro compass circuit.
Shafts furnish power.
  Shaft revolution indicator circuit.

As arranged on the new ships, these circuits all lead to a central switch board.

For all these circuits except one, alternating current is suitable; in a number of cases it is necessary and is already in use as shown by some of the motor generator sets. For the telephone circuit, alternating current is not suitable, and a motor generator supplying direct current could be used as at present. A better plan, however, would be to use duplicate storage batteries, using these alternately, and charging them by means of a mercury arc rectifier; a battery is more suitable for telephone work as it has no scratching of brushes or humming noises to transmit to the telephone. A battery composed of 16 cells of the B-4 type of Edison cell would give a voltage of 19.2, and would weigh 120 lbs., and occupy a space $8\frac{1}{2}$ inches high, $6\frac{8}{16}$ inches wide, and about four feet long. Two of these would be just as reliable, would be lighter, take up less space, and would be more satisfactory than the present duplicate motor generator sets.

For the wireless sets, a frequency changer would have to be used, for although alternating current is used for this work, the commercial frequency of 60 is found to be not so efficient as a frequency of 500.

For the search-lights, alternating current would be used but it would be transformed to the proper voltage instead of using a very large and wasteful rheostat as is done at present; a constant current transformer would be used for this purpose.

The lighting circuit of the ship would be wired as a single-phase circuit.

In looking over the ship's complete installation, it will be noticed that a great variety of voltages exist, requiring a great

number of motor generators; also that alternating current is at present used in a number of cases; and also that, on account of the desirability of suitably locating the motor generators, it becomes necessary to make all circuits extend practically throughout the ship. If alternating current were substituted, all these motor generators could be replaced by transformers, which, on account of their small size and reliability, could be placed wherever it is necessary to run a circuit. Thus many of the circuits could be localized, doing away with much wiring; also, if it should become desirable to add new circuits, this could be done very readily and without installing motor generator sets. The first cost and cost of upkeep would be reduced and the care necessary for maintenance would be much less; by removing a great many of the small circuits, a fruitful source of grounds would also be removed. To go more into detail, take the gun firing and sight lighting, turret tell-tale, and turret danger zone circuits; these circuits could be taken from the turret lighting circuit, a small transformer giving the proper voltage, so that none of these circuits would have to go outside of the turrets. The same thing would apply to several other circuits, such as the F. R. and E. R. telephone bells, the refrigerator room and magazine temperature indicator circuits, fuel oil tank indicator circuits, stateroom call bells circuit, torpedo firing circuit, gyro indicators, etc.

The generators themselves would be simpler and cheaper machines if of the alternating type; they would also be especially suited to the turbine drive and less liable to most troubles generally than the direct current generator.

In the case of the motors, the advantage is still more pronounced; while having an efficiency equal to or better than a direct current motor, the induction motor is more compact, requires much less attention, costs less for maintenance, and is far less liable to break down.

Some minor advantages of alternating current are—less trouble with switches on account of arcing and burning, non-magnetic leads, less corrosive effect, more reliable circuit breakers, and less danger of installation breakdowns, resulting from circuit breaker operation.

To sum up the advantages of the alternating current system, it seems to be cheaper, simpler, more reliable, and to require less care and attention.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EARLY VOYAGES OF AMERICAN NAVAL VESSELS TO THE ORIENT.

By CHARLES OSCAR PAULLIN.

XIII.

THE EAST INDIA SQUADRON IN THE WATERS OF CHINA AND JAPAN: 1854-1865.[1]

The commanders-in-chief of the East India squadron, their periods of service, and their flagships, from the departure of Perry for the United States in 1854 to the discontinuance of the squadron on the outbreak of the Civil War in 1861, were as follows: Commodore Joel Abbot, 1854-1855, *Macedonian;* Commodore John Pope, 1855-1856, *Macedonian;* Commodore James Armstrong, 1856-1858, *San Jacinto;* Commodore Josiah Tattnall, 1858-1859, *San Jacinto* and *Powhatan;* Commodore C. K. Stribling, 1859-1861, *Hartford;* and Commodore Frederick Engle, 1861, *Hartford.* All of these officers, with the exception of Pope, who entered the navy in 1816, served in the War of 1812. Abbot died on the China station. Resigning from the federal navy in 1861, Tattnall was made senior flag officer of the Georgia navy and later captain in the Confederate navy, in which service he held several important commands. Armstrong was given no active duties at sea after 1858, nor Pope and Engle after 1861. In 1864-1865 Stribling commanded the East Gulf blockading

[1] The chief sources of information for this chapter are the East India Squadron Letters, 1853-1861; Commanders' Letters, November, 1861-March, 1862, July, 1863-January, 1864; Officers' Letters, February-April, 1862; Captains' Letters, February-September, 1864; Hoppin, J. M., Life of Andrew Hull Foote, 111-135; Jones, C. C., The Life and Services of Commodore Josiah Tattnall, 74-123; Johnston, J. D., China and Japan, 68-361; Williams, F. W., The Life and Letters of S. Wells Williams, 249-326; and Sen. Ex. Doc., No. 30, 36 Cong., 1 sess.

squadron. Armstrong and Pope reached the rank of commodore; and Engle and Stribling, of rear-admiral, on the retired list, the last named dying in 1880 the senior officer of his grade.

The East India squadron regularly consisted of three or four vessels until the outbreak of the Civil War, when its size was reduced and the squadron organization discontinued. When Pope took command of it in 1854, the principal ports visited by its ships were Canton, Whampoa, Macao, Hong Kong, Amoy, Ning-po, Fu-chau, Shanghai, Shimoda, Hakodate, Manila, and Singapore. Its headquarters were at Hong Kong, where in 1854 Perry established a naval depot, discontinuing the one at Macao. News from Europe and the United States was first received in China at Hong Kong, much of it coming by way of England and the overland route. In 1852, a naval depot was established at Shanghai, the American trade with which port three years later exceeded that with Canton. Our commerce with China was greatest from 1850 to 1860, declining rapidly during the Civil War and never regaining its former position after that conflict. By 1876 the British had driven the American ships entirely from the China trade, and were even supplying New York with east teas.

The period 1854-1865 in China was mainly one of civil strife and foreign wars, and consequently the officers of the American squadron were frequently called upon to protect the lives and property of their fellow-countrymen. The Taiping Rebellion, beginning in 1850 and lasting until 1865, was one of the greatest insurrections in the world's history, during which, it is said, twenty million people lost their lives. The second English war with China began in 1856, and continued, with intermissions, for four years, France being drawn into the struggle in 1857. In 1863-1864 there was a revolution in Japan. The negotiating of a second American treaty with Japan in 1856-1857 and with China in 1858 gave additional work to the officers of the squadron.

In 1853-1854 the Taiping Rebellion caused Commodore Perry no little trouble, compelling him to station vessels in the neighborhood of both Canton and Shanghai. On March 6 of the latter year the Chinese war ship *Sir Herbert Compton,* fired upon an American pilot boat near Shanghai, brought her to, boarded her, hauled down her flag, captured her Chinese crew, and hung them up by their queues to the mainmast of the war ship. When Com-

mander John Kelly, of the U. S. ship *Plymouth,* received news of this outrage, he ordered Lieutenant John Guest to proceed with one of the cutters of the *Plymouth* to the *Sir Herbert Compton* and obtain the release of the captured boat. Guest executed his commission with such boldness and celerity that he retook the prisoners and the boat without the firing of a shot on either side. In April, Kelly co-operated with a party of British bluejackets and volunteers in defending the lives and property of the foreigners at Shanghai. The American party consisted of sixty seamen and marines from the *Plymouth* and some thirty or forty officers and sailors of merchantmen and residents of Shanghai. The combined force attacked an encampment of Imperialists, forcing it to retreat and leave its dead and wounded on the field. The Americans lost one seaman killed and one seaman and two marines wounded, and one merchant captain killed and the chief clerk of the house of Russell and Company wounded.

In the fall of 1854, the chief seat of disturbance on the coast of China was at Canton, which city then seemed likely to fall into the hands of the Revolutionists, who had already taken Shanghai and Amoy. For the protection of American interests, Commodore Abbot stationed his flagship at Whampoa and the chartered steamer *Queen* at Canton, and concerted measures of defense with Rear-Admiral Sir James Stirling, the British commander-in-chief in China. Determined to maintain a neutral position, Abbot came into collision with some of the American residents at Canton, who were in favor of preventing the Revolutionists from attacking the city. When in March, 1855, the Imperialists defeated the Revolutionists, the civil commotion subsided, and Abbot dropped down to Hong Kong.

The unsettled state of China was taken advantage of by pirates who infested the entire coast of that country. In November, 1854, a party of Americans under the command of Lieutenant G. H. Preble, in co-operation with the British forces, struck a severe blow at these freebooters, destroying sixty-eight of their junks and two piratical depots situated on shore not far from Hong Kong. One American seaman, belonging to a landing party commanded by Acting Master J. G. Sproston, was killed. Preble was commended by both Commodore Abbot and Rear-Admiral Stirling. In the summer of 1855 he was again engaged in suppressing the pirates, making two expeditions against them, one to the

southward and the other to the northward of Shanghai. In the latter he again co-operated with the British visiting among other ports Chi-fu and Wei-hai-wei, where the American flag was displayed for the first time. In August of that year a party of seamen and marines from the American ship *Powhatan* and the English sloop *Rattler*, destroyed a fleet of piratical junks and captured many prisoners off Khulan. Nine seamen and marines were killed, five of whom were Americans. To commemorate this event a monument was erected in the cemetery at Happy Valley, Hong Kong.[2]

While Abbot was commander-in-chief of the squadron, but a single vessel, the steamer *Powhatan*, Captain W. J. McCluney, visited Japan. She was dispatched thither with Commander H. A. Adams, the bearer of the ratified treaty of Yokohama, who had been ordered by the government at Washington to exchange ratifications with the Japanese. This formality took place at Shimoda on February 21, 1855, the *Powhatan* displaying a Japanese flag and firing a salute of seventeen guns. About a month before her arrival at Shimoda, an earthquake had greatly damaged that town and the neighboring region, injuring the Russian ship of war, *Diana*, Admiral E. Pontiatine, which sank at sea. Fortunately her officers and crew were rescued, and, being in distress, were generously supplied with provisions by McCluney. Pontiatine succeeded in his mission to Japan, the negotiation of a treaty similar to that of Perry.

The personnel of Commodore Abbot's squadron suffered more or less from severe diseases formerly so common on shipboard in the East Indies. That the commodore himself was stricken with a dire malady, we learn for the first time from a letter to the Secretary of the Navy, dated Hong Kong, November 12, 1855, in which he wrote incidentally as follows: "My own health is such that my fleet surgeon offers me no encouragement that I shall live to return to the United States, but remarks, however, if I could sail immediately, there might be some slight chance of my restoration to health, and I am strongly urged by many persons to do so; but I belong to the old school and have been taught not to leave my post until regularly relieved."[3] A month later he

[2] Collum, R. S., History of the United States Marine Corps, 104; Ford J. D., An American Cruiser in the East, 405.

[3] East India Squadron Letters, 1854-1855, 279.

wrote his last dispatch to the department, and on the following day he died, at the residence of the naval storekeeper at Hong Kong. A few days later his body was removed to the *Macedonian*, under an escort of soldiers from Her Majesty's 59th Regiment, furnished by the governor of Hong Kong, and of marines from the English squadron, furnished by Rear-Admiral Stirling. During the march of the procession minute guns were fired by the *Macedonian*, the British frigate *Winchester*, and the British batteries on shore. From Hong Kong his body was transported to America.

The officer next in rank was Captain John Pope, who at the time of Abbot's death was at Amoy in command of the *Vandalia*. Proceeding to Hong Kong, he transferred his flag to the *Macedonian*, and thence shortly sailed for Singapore, where on April 5 he was relieved by his successor in command of the squadron, Commodore James Armstrong, who had recently arrived there on board the flagship *San Jacinto*, Captain H. H. Bell. Continuing his voyage homeward, Pope reached Boston in August.

In the summer of 1856 Armstrong conveyed to Shimoda Mr. Townsend Harris, the first American consul-general to Japan. Here he spent two weeks awaiting the recognition of Harris by the Japanese government and Harris's removal ashore to the consular residence. Armstrong attended an entertainment given in honor of the Americans by the Imperial commissioners from Yedo, and he returned their courtesy by receiving them and their suites on board the *San Jacinto*. They were much pleased with the salute fired in their honor and with the exercises of the crew with the great guns and small arms. At one of the entertainments, they asked Armstrong if he could not take the consul-general away with him. "No," he replied, "my instructions are to take him to Shimoda, to see him established in his consular house, to erect his flagstaff, and to leave him there." They then asked if he could not convey to his government the reasons why they wished the consul-general to leave Shimoda; and he answered them that all communications to his government must be sent through Harris. To their third and last question, "At what time shall you leave?" Armstrong curtly replied, "I shall leave when I am ready."[1]

From Shimoda the commodore went to Shanghai, where he arrived on September 13; and thence early in November, he sailed

[1] East India Squadron Letters, 1855-1856, 82-85.

for Hong Kong, giving passage to Dr. Peter Parker, the American commissioner to China. The American legation at this time was somewhat peripatetic, and was to be frequently found on board one of the ships of the squadron in transit from one Chinese port to another. When, as sometimes happened, it was denied transportation by the commander-in-chief, for what seemed to him good and sufficient reasons, the commissioner complained to the state department. Friction between the naval and diplomatic services in the Far East continued to exist until the government at Washington fixed definitely their respective spheres of duty.

While Armstrong was at Shanghai in October, 1856, hostilities broke out in the neighborhood of Canton between the English and Chinese. Mr. O. H. Perry, our consul at Canton appealed to Commander A. H. Foote, of the ship *Portsmouth* lying at Whampoa, to protect the lives and property of his fellow countrymen. Foote responded by conveying to the American factory at Canton four boat loads of seamen and marines, eighty-one in number, which he organized into companies, posting sentinels on the house tops and manning some newly erected fortifications. He was shortly re-enforced by sixty-nine officers and seamen from the *Levant*, Commander W. Smith, which ship joined the *Portsmouth* at Whampoa. On November 3 some of Foote's sentinels were fired upon by Chinese soldiers and they returned the fire, but no one was injured.

Receiving information of Foote's movements, Armstrong sailed from Hong Kong to Whampoa, where he arrived in the *San Jacinto* on November 12, and at once dispatched the marine guard of his ship with arms and ammunition to Canton. Three days later, after a consultation with Foote, he resolved, in order to avoid the danger of compromising our neutrality, to withdraw the forces that had been landed at Canton, a step urged by Yeh the Chinese high commissioner and governor-general. He decided, however, to keep one of the vessels of the squadron near the factories as a refuge for the Americans in case their lives were endangered. On the afternoon of the 15th Foote left Whampoa for Canton for the purpose of directing Commander Smith to return to Whampoa and bring his ship up the river preparatory to the withdrawal of the American forces from the city. For the events immediately succeeding Foote's departure the official report of Armstrong may be quoted:

At about 5 p. m., Commander Foote returned to this ship and reported to me that, when off the forts, known as the "Barrier Forts," situated about midway betwen this anchorage (Whampoa) and Canton, his boat was fired into five times with both grape and round shot, but fortunately without doing any injury. I immediately dispatched Commanders Foote and Bell to procure one or more steamers for the purpose of towing the *Portsmouth* and *Levant* off those forts to redress this outrage upon our flag. At daylight the next morning (the 16th) the American steamer *Kum Fa* was dispatched by me to Canton to bring the marines, men, launches, and howitzers, belonging to this ship and to the *Portsmouth* down to the latter vessel. Lieutenant Williamson, of this ship, with one of our cutters, with an armed crew, and having with him Mr. Ayres, a pilot, was sent to sound out the channel up to the forts. Lieutenant Williamson returned to the ship at noon and reported that he had sounded to within less than half a mile of the forts, when he was fired upon three times with grape and round shot, and, I regret to say, that by one of the shots, the coxswain of the boat, Edward Mullen, was instantly killed, while in the act of heaving the lead.

The *Kum Fa* having returned to this anchorage with the force from Canton, I ordered Commander Bell to take command of the *Levant* (Commander Smith with a small force having been left at Canton, for the protection of our citizens and their property); and, having divided the crew of this ship with the *Portsmouth* and *Levant*, excepting some 60 men with Lieutenant Williamson and the warrant and engineer officers to take care of her (she drawing too much water to go up the river), I repaired on board the *Portsmouth*, accompanied by the fleet surgeon, Dr. Wood, and my secretary, hoisted my pennant on board of her, and in tow of the American steamer *Willamette*, the *Kum Fa* towing the *Levant*, got under way and stood up the Whampoa channel, and anchored in the *Portsmouth* within 500 yards of the nearest fort, at about 4.20 p. m., and got the ship in position for shelling the forts. The forts opened a brisk and well directed fire upon her before she had come to an anchor, which was at once returned by her with a rapid discharge of shells, and which was kept up with little intermission until dark. The Chinese fired exceedingly well and hulled the *Portsmouth* six times, but doing no material injury to her. The *Levant's* position, she having grounded about one mile below us and out of range, did not permit of her joining in the attack. The largest of the forts, and the one nearest to us, was silenced early in the evening: and the fire of the others became very languid at the close of the action. The *Portsmouth*, I regret to say, had one of her marine guards very seriously wounded.

The coolness and skill of Commander Foote in taking the *Portsmouth* into action under fire of the enemy, together with the enthusiasm and discipline displayed by his officers and crew, excited my warmest admiration. Never before had I seen such precision of firing or more steadiness in battle. During the night the *Levant* was got off and placed in position, keeping her broadside sprung all the following day upon the forts.

On the 17th the *Portsmouth* having grounded in the narrow channel, the two ships remained inactive, except in getting out kedges, etc., to haul off

by. While in this condition, and in some degree at a disadv forts did not resume firing. I, therefore believing that their dis means of hostility had terminated, thought this a favorable opp obtain from the Imperial Commissioner at Canton an explanat cause of the attack upon our flag and a security that it sho repeated. With this in view I returned to the *San Jacinto,* lea mander Foote in command, with orders to keep in position upon but not to fire unless assailed by them.[1]

On the 19th, learning that the Chinese were repai strengthening their defenses, Armstrong ordered Foot vent this and "to take such measures as his judgme dictate, if it were even the capture of the forts." How th Foote carried out his orders may be seen from his offici dated November 26, 1856.

At 6.30, on the morning of the 20th instant, both ships being i and in all respects ready for action, we beat to quarters, and ously opened on the two nearest forts. After an interval of fiv the fire was briskly returned until 7.45, when it materially slacke storming party, consisting of 287 persons—officers, seamen and with four howitzers, commanded by myself—Commanders Bell a leading respectively detachments from the *San Jacinto* and *Le* left the ships, and pulled in three columns for the shore. The co marines was most efficiently led by Captain [John D.] Simm landing, Louis Hetzel and Thomas Krouse (apprentice boys) w by the accidental discharge of a Minie rifle. The party for marched towards the fort, dragging three howitzers with them a rice-fields, and wading a creek waist deep. In order to attack th the rear it was necessary to pass through a village, in which sev were fired upon us, till the howitzers cleared the streets, and se us an unobstructed advance. When near the fort, the soldiers fleeing from it, many of them swimming for the opposite sho marines, being in advance, opened fire upon the fugitives with dea killing some 40 or 50. The American flag was planted on the wa fort by a lieutenant from the *Portsmouth.* As the fort opposite ing upon us with some energy, the guns we had captured—53 in were several of them brought to bear and soon silenced it, but not shot had struck the *Portsmouth's* launch in the water line and She floated, however, at the flood, and was soon rendered effi further service. The city of Canton being only four miles dista tion of its army, variously estimated at from 5000 to 15,000, and believe to have numbered at least 3000, was stationed near. T twice advanced; but they were both times repulsed by the mari 10 or 12 killed; and, as they were retreating, a deadly fire was ope them from one of the howitzers. During one of these skirmish belonging to the *Portsmouth's* howitzer crew received a shot-wou

[1] East India Squadron Letters, 1855-1856, 125-127.

leg. While firing at the opposite fort, a boatswain's mate from the *Portsmouth* was wounded in the head and foot by the bursting of a gun. A small portion of the force was withdrawn at night, and the fort was occupied by the commander of the *San Jacinto* with the remaining force till morning.

At three a. m. the next day an 8-inch shot from one of the forts struck the *Portsmouth* and lodged in the bends. This was instantly returned by three of her shells, and the fort was at once silenced. At four a. m., the commander of the *San Jacinto*, with the force which had occupied the captured fort during the night, embarked and returned to the ship. At six o'clock both ships opened their fire on the three remaining forts, which was at first briskly returned. During the action Edward Riley (O. S.) was mortally wounded aboard the *Levant*, and died this evening. The fort nearest the ships having been silenced, at seven o'clock the boats in tow of the American steamer *Kum Fa*, temporarily in charge of Mr. Robinet, having on board the engineers from the *San Jacinto*, Mr. Henry C. Victor and Mr. C. H. Baker, with a crew from the *San Jacinto*, left the ships and proceeded towards the object of attack. While passing the barrier, a ricochet 64-pound shot from the farthest fort struck the boat abreast of my own, completely raking it, and instantly killing James Hoagland, carpenter's mate, and mortally wounding William Mackin and Alfred Turner, who died soon after. Seven others were also wounded more or less severely. The boat struck was the launch of the *San Jacinto*, in charge of the first lieutenant of that ship. The steamer stood in with the boats in tow, till they were covered by an intervening neck of land, on which the party landed. After wading a ditch waist deep, and receiving several shots from gingals and rockets, the fort was carried, with one of the marines severely wounded, in presence of a thousand or more Chinese soldiers just beyond howitzer range. A corporal of marines, the standard-bearer of the company, planted the American flag upon the walls. Several of the guns of the fort, with our howitzers, were brought to bear upon the centre fort, commanding the river, which had opened fire upon us. It was soon silenced. The other guns, in the fort we had captured, which were altogether 41 in number, were spiked, their carriages burned, and everything destructible, by the means in our power, destroyed.

At four p. m. the marines advanced on the bank of the river and captured a breastwork mounting six guns; a party of Chinese soldiers, some hundreds in number, advanced towards them, but were soon repulsed by two companies of sailors, led by their lieutenants. In the meantime one of the howitzers played upon a still greater number, who were drawn up in front of and around a pagoda, until they were dispersed, and retreated carrying off their killed and wounded. The boats, under fire from the fort on the opposite side of the river, had been tracked up to the breastwork, and now, under cover of its guns and those of the fort just captured, they crossed with the party to the island, and took possession of its fort, containing 38 guns; one of these was a brass gun, of 8-inch calibre, and 22 feet five inches in length, greatest circumference eight feet three inches, diameter of bore eight and a half inches. The standard-bearer of

his wardroom officers, called upon the two governors stationed there. "We were received," wrote Foote in describing his visit, "with great courtesy and apparent cordiality. They enquired with a good deal of interest how the President and Government of the United States regarded Japan; about the war in China, its cause and probable result; and expressed the hope that at some future period, the Japanese would visit America for the purposes of education and obtaining a knowledge of many things in which they acknowledged their deficiency. I stated to the governors that our men of war in future would no doubt visit Japan more frequently, as the occupation of the squadron in looking out for our interests in China had prevented a vessel being in Shimoda and Hakodate during the past year."*

On January 29, 1858, Commodore Armstrong transferred the squadron to his successor, Commodore Josiah Tattnall, and returned to the United States. Tattnall first hoisted his broad pennant on board the *San Jacinto*, but on the arrival at Hong Kong of the *Powhatan*, in May, he made that vessel his flagship. His most important work in the Far East was performed in connection with the negotiation of new treaties with China by the principal Occidental powers. In the spring of 1858 he placed at the service of Mr. William B. Reed, the American envoy, the steamers *Minnesota*, Commander S. F. Dupont, and *Mississippi*, Commander W. C. Nicholson, and chartered for his use from the house of Russell and Company, the light-draft steamer, *Antelope*. Reed's plan was to negotiate a treaty at or near Peking, which lies in the interior, near the Peiho, one of the largest rivers of northern China, emptying into the bay of Pechili. On arriving at the mouth of the Peiho, he, together with the envoys of Great Britain, France, and Russia, were delayed some time by the dilatory tactics of the Chinese. While waiting here, Commander Dupont conferred with Tan, one of the Chinese high commissioners, and delivered to him the official letter of President Buchanan. Finally, after the British and French fleets had opened the river by capturing the Taku forts near its mouth, Reed and Dupont proceeded to Tientsin, seventy miles distant, on board the *Antelope*. Here, on June 28, Reed and the Chinese commissioners signed the Treaty of Tientsin. On returning to the mouth of the Peiho he reported his success to Tattnall, who had arrived there

* East India Squadron Letters, 1857-1858, 214-215.

with the *Powhatan*. The negotiations of the British, French. and Russians were also successful. The new treaties with China provided for the opening of several additional ports to foreign commerce, granted to foreigners many important privileges respecting trade, property, and travel, and permitted representatives of the Western powers to reside at Peking.

On the ratification of the Treaty of Tientsin by the President and Senate, Mr. John E. Ward, Reed's successor, was directed to exchange ratifications with the Chinese government. Arriving at Penang, Ward was given passage on board the *Powhatan*, to Hong Kong. Here Tattnall purchased the English steamer *Toey-wan*, a small vessel of one hundred and seventy-five tons burden, for use in ascending the Peiho. Stopping at Shanghai, Ward conferred with the Chinese high commissioners, and at their request consented to proceed to Peking with the English and French envoys, who had been appointed by their respective governments to exchange ratifications. On June 21, 1859, the *Powhatan* and *Toey-wan* arrived at the anchorage off the mouth of the Peiho, where they found the fleets of Great Britain and France. Here the progress of the envoys was arrested by some newly erected forts and barricades. The commanders of the British and French fleets notified the Chinese that if they did not remove these obstacles by the 25th, the day fixed for the exchange of ratifications, they would do so themselves. The Chinese insisted that the true mouth of the Peiho was ten miles northward, and that the envoys should proceed thither and await the arrival of the commissioners from Shanghai. After deliberating over the situation, Tattnall and Ward decided to pretend ignorance of the fact that access had been denied the English and French, and to pass up the river as far as the barricades in the *Toey-wan*. Their movements are thus described by Tattnall in a letter written on July 4:

> We entered the river in execution of our plan at 11 a. m on the 24th ult., and passing through the British squadron without communicating pushed up towards the barriers. At this time not a man was to be seen at the forts, nor a gun in an embrasure, nor, although flagstaffs were on the parapets, was a flag displayed. There was nothing to indicate that the forts were armed or manned. Subsequent events show this to have been a deception and ambuscade, intended, I do not doubt (in the confidence of their own strength and the small force of the English) to invite a conflict in order to annul the treaties of last year. We had approached to within three hundred yards of the first barrier, at which point should we

not be fired on, I had purposed anchoring, when we grounded and failed in all our efforts to back off. The tide was falling fast and our situation was critical, not only from the facility with which the batteries might demolish us, but, as we were on the edge of a steep bank, from the probability of the steamer falling over and filling.

At this moment I received from Admiral James Hope an attention and kindness which must place me under lasting obligations to him. Although he had reason to think that she would be fired upon by the forts, he sent a gunboat to my aid, with the message that, had he known of my intention to pass up he would have furnished me a pilot, and that he expected to see me fired on. The gunboat failed in her effort to extricate me and there being, as I have said, a probability of the *Toey-wan's* falling over and filling, the Admiral despatched a second gunboat to me, placing her entirely at my disposition, with the handsome and generous offer that I should hoist on board of her the American ensign and my own personal flag. I declined the offer, with a just appreciation, however, of the personal kindness to myself and the delicate compliment to our service. The *Toey-wan* was more fortunate than I expected, and a favorable wind having sprung up we got her off at high water.

About two hours after grounding we sent a boat to the nearest fort with my flag lieutenant, Mr. Trenchard, and the interpreter to inform the commanding officer that the American minister was on board the *Toey-wan* on his way to Tientsin and Peking in accordance with our treaty and an understanding with the Chinese commissioners at Shanghai. They were met at the landing by an officer, professing to be of low rank, who said that his orders were, not to permit the removal of the barriers and to fire on those attempting it. That he believed that a high officer had been appointed to meet the ministers at the North. He also asserted most falsely, as subsequently shown, that there were no troops and only a few country militia in the forts. Although the interpreters were allowed to get out of the boat for greater facility of conversation, they were not permitted to approach the forts.[*]

On the afternoon of the 25th (to be exact, at 2.45 p.m.), the British and French, to the number of twelve hundred men, sailed up the river for the purpose of removing the obstructions. As they approached the first barrier, they were fired into by the Chinese forts, which suddenly became alive with soldiers, hitherto concealed. Taken thus by surprise, they were overwhelmingly defeated, losing four hundred and fifty men, killed and wounded. For a time Tattnall remained in the rear of the contestants, painfully disappointed at the turn the engagement had taken. For the part that he later played his own words are the best authority:

The fire was concentrated on the flag of the admiral. By this time, 4 p.m., several of his vessels had been sunk and it was evident to me that

[*] East India Squadron Letters, 1858-1859, 158-159.

nothing could enable him to extricate himself and retire from the hopeless conflict, but the reserve of boats and men at the junks; but at the time the tide was running too strong for the crowded boats to stem. The officer in charge of these boats now visited me. He said nothing of aid, but his silent appeal was powerful indeed. In the few moments he was on board he would look anxiously, alternately at his admiral and at the boats.

After he left I held a consultation with Mr. Ward, and he agreed with me perfectly that under all the circumstances of our position with the English, and the aid the admiral had tendered me the day before, I could do no less than to tow the boats to his relief. I made the offer which was thankfully and promptly accepted. While the boats were making fast to hawsers, which I veered astern, I insisted on Mr. Ward and his suite leaving the *Toey-wan* and going on board one of the junks, for reasons that will be obvious. He at first reluctantly yielded and left us, but soon returned in one of the English boats, declaring that, as the *Toey-wan* was his home and was going under fire with his approbation and concurrence, he would remain in her. I reluctantly yielded to his gallant impulse. At this time a young British officer came to me from the vessels engaged, to say that the gallant admiral was dangerously wounded, and had but six men left. He (the officer) had two boats sunk in reaching me. I towed the boats through the British line to within a short distance of the admiral, whose flag was flying on the *Cormorant*, when, casting them off, I retired to the rear of the line, near the French gun-boat and anchored for the night. I took up this position as it might enable me to aid the wounded and, should boats be sunk, to rescue their crews.

After anchoring I thought of the admiral and of his chivalrous kindness to me the day before, which, from an unwillingness to intrude on him when he was preparing for action, I had in no way yet acknowledged. I therefore, with my flag lieutenant, Mr. Trenchard, went in my barge to visit him. When within a few feet of the *Cormorant*, a round shot struck the boat, killed my coxswain and slightly bruised my flag lieutenant. We fortunately reached the *Cormorant* before the boat entirely filled. I found the admiral lying on his quarter-deck, badly wounded. I informed him that I had called to pay him my respects and to express my regret at his condition. After remaining on board the *Cormorant* about ten minutes I took advantage of an English boat that was passing to return to the *Toey-wan*.

The *Cormorant* after this was sunk and the admiral, shifted his flag to a fourth vessel, the *Coromandel* (a thing I believe unprecedented), thus evincing an indomitable valor under very disheartening and almost hopeless circumstances. At dusk, about 8 p. m., a desperate attempt was made, by landing from boats to storm the forts, but they stood in an impassable morass and the assailants were repelled with heavy loss.

On the morning following this day and night of slaughter, the action still continuing, but the fire more feeble and distant, I found that six of the English vessels were sunk, and that the remainder had withdrawn to a more distant and safer position, from which they could easily retire out of gunshot. I now prepared to return to the *Powhatan* with Mr. Ward, but

first called on board the *Coromandel* to take leave of the admiral and also on board the French gunboat to enquire after the French Commodore, Tricault, whom I had met on board the *Cormorant* when I called on the admiral and who had subsequently been wounded. I deferred my departure, by request, that I might tow to their ships at sea two launch loads of the wounded English. On reaching the *Powhatan* I again despatched the *Toey-wan* into the harbor in charge of Lieutenant [James D.] Johnston (first of the *Powhatan*), with orders to remain at the mouth of the harbor, out of fire, and to afford all aid consistent with our neutrality. After an efficient performance of this duty for 24 hours he rejoined me.

The sea officers with me in the *Toey-wan* on this service were Captain [George F.] Pearson, Lieutenant [Stephen D.] Trenchard and [Alexander A.] Semmes, all of the *Powhatan*, and Midshipman [Clarke] Merchant of the *Germantown*. The engineer officers were Messrs. [George W.] City and [Edward R.] Archer. Captain A. S. Taylor of the marine corps was also with me. I have to thank them for their zealous services.[10]

Certain other aid rendered the British by the Americans is not mentioned by Tattnall in his official report. The injuries done to his boat by the Chinese on the occasion of his first visit to Admiral Hope caused it to fill, partly sink, and float away, compelling the crew to seek refuge on the *Cormorant*. Finding themselves aboard a British vessel during a fight, some of the men, following their own impulses, and being, as they expressed it, "in the way and nowhere to go," joined the weary Britishers at the guns and helped them to load. When the commodore returned to the *Toey-wan*, a few men were left behind, as they were too busy at the guns to hear his call, and remained with the British a good part of the night. None of them was wounded.[11]

Tattnall undoubtedly violated his country's neutrality. The grounds of his defense were that he was placed in a measure on the same footing as the English and French, since in response to a request of the Chinese the three envoys were acting in unison; and that, as Admiral Hope had aided him when in a precarious position, he could do nothing less than return the favor. It was in this connection that he so aptly quoted the ancient proverb, "Blood is thicker than water." The administration at Washington approved his conduct, and the government at London expressed its thanks to President Buchanan, requesting that they be communicated to him and to Ward. The generosity of the

[10] East India Squadron Letters, 1858-1859, 160-162.

[11] Williams, F. W., The Life and Letters of S. Wells Williams, 305; Clowes, W. L., The Royal Navy, VII, 128-129.

Americans was much appreciated by the officers of the Royal Navy, and they never forgot it. After the Civil War, Tattnall having taken the losing side in that conflict, some British officers subscribed a sum of money for the relief of his wants.

The repulse of the British and French fleets at the Taku forts caused them to return to Shanghai. The American fleet sailed northward to the mouth of the Pehtang river, ten miles from the Peiho, where friendly relations were established with the governor-general of Pechili. On July 20 Mr. Ward, Lieutenant Trenchard, and several other officers proceeded to Peking. After a short stay there, they returned, having failed to exchange ratifications, a formality that finally took place at the mouth of the Pehtang. On the completion of Ward's mission, the American ships sailed for Shanghai.

In the summer of 1858 Tattnall visited Nagasaki in the *Powhatan*, meeting there the *Mississippi*—the first American naval vessels to call at that port since the visit of the *Preble* in 1849. From Nagasaki he sailed for Shimoda, where he arrived in season to be of assistance to Consul-General Harris, who had recently made a treaty with Japan that was still unsigned. Fearing that one of the European nations might complete a treaty before the Americans completed theirs, he readily consented to convey Harris to Kanagawa and assist him in obtaining the desired signatures. On July 29 the new treaty between America and Japan was signed in the cabin of the *Powhatan*. It provided for the residence of diplomatic agents at Yedo, and of consuls at the open ports, the number of which was increased to six by the addition of Kanagawa, Niigata, and Hyogo.

About this time the Japanese decided to send an embassy to America, and, on the request of the government of Japan, Tattnall agreed to convey it thither on board a national vessel. He transferred the squadron to his successor at Hong Kong in November, 1859, and a few weeks later proceeded to Yedo Bay. On January 16, the ambassadors came on board the *Powhatan* to pay their respects and view their quarters, being received with a salute of seventeen guns. On February 13 Tattnall sailed for San Francisco, with a party of seventy-one Japanese, including Chief Ambassador Shimmi, an assistant ambassador, a censor, ten minor officials, two doctors, three interpreters, and an array of barbers, pike-bearers, armorers, and servants.[12]

[12] Griffis, W. E., Townsend Harris, 323.

The duties of the East India squadron under the command of Commodore C. K. Stribling were largely of a routine character. In October, 1860, Stribling in his flagship *Hartford,* on a voyage from Nagasaki to Kanagawa, passed through the Inner Sea of Japan, a channel which was that year opened for the first time to foreign ships. Returning to Hong Kong, he was appointed chargé d'affairs to China *ad interim*, by Minister Ward, an office which he filled for several months. On November 9, 1860, the steam frigate *Niagara,* arrived at Kanagawa, with the Japanese embassy, which was returning home from America. When on the following day the distinguished passengers disembarked, the yards were manned and a salute was fired in their honor.

In the spring of 1861 there were five vessels on the East India station. On March 18 of that year, the Secretary of the Navy ordered two of them to return home, and on the outbreak of the Civil War, he gave the three remaining vessels similar orders, and directed Commodore Stribling to transfer his squadron to Captain Frederick Engle, his senior officer, and to return to America by way of the overland route. A few weeks before Stribling was superseded, he issued the following general order for the purpose of quieting the excitement in his fleet caused by the fall of Fort Sumter, and of arousing a sentiment in behalf of the Union among those who wavered in their allegiance. That its author was a native of South Carolina makes it all the more remarkable.

The commander-in-chief feels called upon at this time to address those under his command upon the condition of our country.

By the last mail we have authentic accounts of the commencement of civil war in the United States, by the attack and capture of Fort Sumter by the forces of the Confederate States.

It is not my purpose to discuss the merits of the cause or causes which has resulted in plunging our country into all the horrors of a civil war, but to remind those under my command of their obligations now to a faithful and zealous performance of every duty. Coming as we do from the various sections of the country, unanimity of opinion upon this subject cannot be expected, and I would urge upon all the necessity of abstaining from all angry and inflammatory language upon the causes of the present state of things in the United States, and to recollect that here we have nothing to do but perform the duty of our respective stations and to obey the orders of our superiors in authority; to this we are bound by the solemn obligations of our oath.

I charge all commanders and other officers to show in themselves a good example of virtue, honor, patriotism, and subordination; and to be vigi

lant in inspecting the conduct of all such as are placed under their command.

The honor of the nation, of the flag, under which many of us have served from boyhood, our own honor and good name, require us now, as ever, that we suffer no blot upon the character of our country while the flag of the Union is in our keeping.[13]

Soon after Engle took charge of the squadron in July, he sailed from Hong Kong for the United States with two of the three vessels under his command, leaving on the station only the *Saginaw,* Commander J. F. Schenck, which ship was too frail to make the homeward voyage at that season of the year. Eager to take part in the war, Schenck, in January, 1862, placed the *Saginaw* in ordinary, leaving her in charge of Lieutenant Charles J. McDougal, with an assistant engineer and six seamen, and embarking with the rest of his officers and crew on board the American merchantman *Swordfish,* bound for San Francisco. Schenck's desire to assist in putting down the rebellion did not excuse him to the department, which chose to consider his action as an abandonment of his vessel. In April, 1862, McDougal was ordered by the British government to remove the *Saginaw* from Hong Kong, since her presence there violated the Queen's neutrality. He proceeded to Macao with her, and thence in a few weeks sailed for San Francisco, where he arrived in July.

From the departure of the *Saginaw* until the arrival at Manila of the steamer *Wyoming,* Commander David McDougal, in August, 1862, there were no national ships in Eastern waters. The *Wyoming,* remained on the Chinese station until the spring of 1864. In June, 1863, she was joined by the corvette, *Jamestown,* Captain Cicero Price, who did not return home until the summer of 1865. Since, during the Civil War, the naval laurels were to be won in America, service in the Far East was not prized by our officers. Writing in December, 1862, to the department, Commander McDougal requested it to direct the return home of his ship in order that he and his officers might "share in the stirring events of the times."

In 1863-1864 the duties of the little fleet were enlivened by several rather important occurrences. In the fall of the former year news reached China that the Confederate cruiser, *Alabama,* was expected in the East Indies, and McDougal at once sailed thence in search of her. Here he cruised for several months, led hither

[13] East India Squadron Letters, 1859-1861, 255.

and thither by rumor and conjecture but never catching sight of the elusive rover, although at one time, when she was passing through the Straits of Sunda, within twenty-five miles of her. At Singapore, a half hour after his arrival, he was presented with the British proclamation of neutrality requiring him to leave within twenty-four hours. In marked contrast was his treatment by the Dutch officers at Batavia and Rhio, who expressed "strong friendship and sympathy for our cause and country." At the latter place the Dutch government lent him some of its coal. Several times the British authorities gave him trouble, alleging that he violated the laws of neutrality and the customs of courtesy.

Captain Price also searched for the *Alabama*. On hearing rumors that she would probably dock in some Chinese port, he went to Amoy in quest of her, and thence sailed to the East Indies, but failed to find her, as she had before his arrival left that quarter for British India. In the spring of 1865 rumors were circulated in the Far East that the Confederate cruiser, *Shenandoah*, had appeared in the China seas, but these proved to be false, and the fears of the American residents in China and Japan were allayed.

The protection of American interests in Japan was the most important service rendered by the *Wyoming* and *Jamestown*. About 1863 the balance of power in that country shifted from the Shogun at Yedo (the Emperor of Perry and early American visitors) to the Mikado, at Kyoto (the real Emperor). The ascendency of the Mikado's party was accompanied with demonstrations against foreign residents. In May, 1863, the American legation at Yedo was burned, and our minister Mr. R. H. Pruyn, was forced to retire to Yokohama. In June the American merchant steamer, *Pembroke*, when on a voyage from Yokohama to Shanghai, was fired on near Shimonoseki at the western entrance to the Inland Sea, by some vessels of the Prince of Nagato, one of the leaders of the anti-foreign agitation. McDougal was at Yokohama when he heard of this outrage, and he at once proceeded to the scene of it with the *Wyoming*. For the events after his arrival there, his official report may be quoted:

On the tide proving favorable we proceeded in the straits, and on opening the town of Shimonoseki discovered a steamer, brig, and bark of war at anchor off the town, with Japanese colors at the peak and the flag of the prince at the fore. We stood for the vessels and on approaching were fired on as we got in range by six batteries, on different positions, mount-

ing from two to four guns each. Passing betwen the brig and bark on the starboard hand and the steamer on the port, we received and returned their fire at pistol shot; rounding the bow of the steamer and getting in position, maintained the action for about one hour. During the affair the steamer got under way, but two well directed shells exploded her boilers. The brig appeared to be settling by the stern and no doubt sank. The amount of damage done the bark must have been serious, as well as great destruction on shore. The straits, opposite the city, are about three-fourths of a mile wide, with strong currents, which made it very difficult to maneuver the ship properly. As I had no charts and my pilots completely paralyzed and apprehensive of getting on shore (in fact did touch once), I was induced to withdraw out of action.

The fire from the shore battery was extremely brisk and continued so as long as we were in range. We were hulled 11 times, and with considerable damage to smoke-stack and the rigging aloft, which was attributed to our passing within the range they were prepared for. I regret to state the loss of four killed and seven wounded (one of whom since dead). . . . It affords me much pleasure to state that the conduct of the officers and crew was all I could desire.[14]

Soon after this engagement, McDougal returned to Yokohama, where he remained several weeks before sailing for China. On his departure the care of American interests in Japan fell entirely to Captain Price of the *Jamestown*, who posted a marine guard at the American legation, and who joined the English, French, Dutch, and Prussians, in the establishment of a military patrol for the security of the foreigners residing in Yokohama. When in the summer of 1864, the American minister visited Yedo, Price gave him passage on the *Jamestown*, escorted him to his residence, and provided him with a guard of sixty men. In July of that year the Prince of Nagato, who was determined to prevent foreigners from navigating the Inland Sea, fired into the American steamer *Monitor*, an irresponsible rover that had been knocking about in the ports of Japan for a year or more. As the English, French, and Dutch had suffered similar indignities at the hands of the prince, they united with the Americans to chastise the offender and to maintain by force of arms the rights guaranteed them by treaty. An expedition, consisting of eighteen ships and a landing force of about eleven hundred men, was prepared and sent to Shimonoseki. Since the *Jamestown* was not adapted for service in shallow waters, Price rented the little steamer *Takiang*, and placed Ensign Frederick Pearson in command of her, with orders to join the expedition. Hostilities began on September 5 and

[14] Commanders' Letters, July, 1863, No. 113.

lasted five days, at the end of which time all the forts and batteries of the enemy had been destroyed, with a loss to the allies of twelve killed and sixty wounded. The *Takiang's* share in the operations consisted in the towing of boats within range of the enemy, the firing of a few shots from a Parrott gun, and the taking care of the wounded. As the result of the victory, the Inland Sea was again opened to foreigners, the prince was pacified, and the allies demanded an indemnity of three million dollars.

In 1864 Price erected a naval hospital at Yokohama on a lot reserved for the use of the United States government. As his presence near the capital gave moral support to the Shogun, who was favorably disposed toward foreigners, he remained at Yokohama the larger part of a year. He left Japan for China in April, 1865, and on June 17 sailed from Macao for San Francisco.

XIV.

EXPLORATIONS, SURVEYS, AND MISSIONS: 1838-1857.[15]

The first exploring expedition sent out by the American government, sailed from Norfolk for the South Sea in August, 1838. It was commanded by Lieutenant Charles Wilkes, who is now chiefly remembered as the captor of Mason and Slidell at the beginning of the Civil War; and it contained six vessels: the flagship, *Vincennes*, brig *Porpoise*, ships *Peacock* and *Relief*, and schooners *Flying Fish* and *Sea Gull*. Its main objects were the survey and exploration of the South Sea, the discovery of islands, reefs, and shoals, and the ascertaining of their true position, and the acquiring of scientific information. A corp of scientists, learned in philology, biology, mineralogy, conchology, botany, and horticulture accompanied the expedition. Among them was the biologist Charles Pickering, the geologist James D. Dana, and the ethnologist Horatio Hale. The work in astronomy, hydrography, geography, magnetism, meteorology, and physics was entrusted to officers of the navy. With Wilkes's explorations in Samoa, the Feejee and Friendly Islands, Australia, New Zealand,

[15] For sources of information, see the Wilkes Exploring Expedition, U. S. Navy Department Archives, Vol. II; Wilkes, C., Narrative of the United States Exploring Expedition, V, 275-410; East India Squadron Letters, 1848-1850, 286-293; 1857-1858, 253; Ringgold-Rodgers Surveying Expedition, U. S. Navy Department Archives; Habersham, A. W., My Last Cruise; and Wood, W. M., Fankwei, 149-260.

the Antarctic region, the West coast of America, and Hawaii, we are not here concerned. Respecting his duties in the East Indies and the Far East, Secretary of the Navy, Paulding, gave him the following instructions, having previously referred to the exploration of our Northwest Coast:

You will then proceed to the coast of Japan, taking in your route as many doubtful islands as possible, and you have permission to pass through the Straits of Sangar into the Sea of Japan, where you may spend as much time as is compatible with your arrival at the proper season in the Sea of Sooloo or Mindoro. Of this sea you will make a particular examination, with a view to ascertain whether there is any safe route through it which will shorten the passage of our vessels to and from China. It is enjoined on you to pay very particular attention to this object, in order that you may be enabled to furnish sailing instructions to navigators. It may be also advisable to ascertain the disposition of the inhabitants of the islands of this archipelago for commerce, their productions and resources.

Having completed this survey, you will proceed to the Straits of Sunda, pass through the Strait of Billeton, which you will examine, and thence to the port of Singapore.[18]

On November 27, 1841, Wilkes left the Hawaiian Islands for the East Indies. Owing to the lateness of the season and the loss of one of his vessels, he abandoned the proposed visit to Japan. The carrying out of the orders of the department respecting the Philippines fell to the *Vincennes* and the *Flying Fish*, which vessels arrived at Manila on January 3, 1842. Here he remained eight days, studying the customs of the people and acquiring information respecting the history, government, and geography of the islands. A scientific party, of which Dana and Pickering were members, explored the interior of Luzon. Soon after his arrival at Manila, Wilkes, accompanied by Mr. Moore, the American vice consul, made an official call on the governor of the Philippines, Don Marcelino Oroa. Of his reception by that official, he wrote as follows:

On our arrival, we were announced, and led up a flight of steps, ample and spacious, but by no means of such splendor as would indicate the residence of vice-royalty. The suite of rooms into which we were ushered were so dark that it was difficult to see. I made out, however, that they were panelled, and by no means richly furnished. His excellency entered from a side door, and led us through two or three apartments into his private audience room, an apartment not quite so dark as those we had come from; our being conducted to this, I was told afterwards, was to be considered an especial mark of respect to my country. His reception

[18] Letters of Officers of Ships of War, XXV, 407.

of us was friendly. The governor has much more the appearance of an Irishman than of a Spaniard, being tall, portly, of a florid complexion. He is apparently more than 60 years of age. He was dressed in a full suit of black, with a star on his breast. Mr. Moore acted as interpreter, and the governor readily acceded to my request to be allowed to send a party into the interior for a few days; a permission which I almost despaired of receiving, for I knew that he had refused a like application some few months before.[17]

Wilkes's movements in the Philippines after he left Manila are described in a letter to the Secretary of the Navy, dated Singapore Roads, February 25, 1842, from which the following extract has been made:

I proceeded to the southern end of Mindoro, and on my arrival despatched the *Flying Fish* to examine Apo Shoal, whilst I began that of the strait of Mindoro. This passage was examined and found to be practicable and safe with ordinary care, and it will be looked upon as somewhat strange that there appears to be more islands undiscovered and unknown hereabouts than in most places, if the charts are to be considered as authority. Those that appear to be known are so entirely faulty in their positions as to make them more dangerous.

Having finished the survey of this entrance to the Sooloo Sea I proceeded along the coast of Panay, having communication with the shore, and making surveys of some of the anchoring grounds; and thence as far south as the island of Mindanao, where I anchored in the port of Caldera, at the entrance of the strait of Basilan. I remained at anchor a day and a half at that place in order to make observations for dip and intensity, and survey the harbor, and then passed over to and through the Sooloo archipelago, and anchored off the town of Soong, in the island of Sooloo, the residence of the Sultan or Rajah. I remained here three days, having friendly intercourse with the Sultan and Datto or Prime Minister, and obtained from him the terms on which he would receive American vessels, in writing, and also a written guarantee to afford all who should have the misfortune to fall into difficulties or be shipwrecked at his islands protection for lives and property.

I then sailed through the group, having fine weather, employed in surveying; passing by the Pangootaran group, and that of Cayagan Sooloo, towards the strait of Balabac, where I anchored under the Mangsee islands on the 8th inst. These two islands were favorably situated for our duties, nearly in the middle of the strait. I immediately despatched the boats on surveying duty, and on the 12th having effected this portion of our duty, I got under way and ran for this port, passing several shoals on my way, and on the 19th anchored in these roads where I found the *Porpoise*, *Oregon* [purchased to take the place of the *Peacock*, which was lost], and *Flying Fish*.

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[17] Wilkes, C., Narrative of the United States Exploring Expedition, V, 293-294.

The result of my examinations in the Sooloo Sea, though not so complete as I could have wished, will be of essential service to its safe navigation and enable vessels to pursue this route, thereby avoiding the dangerous one though the Palawan passage when bound to and from Manila and China during the contrary monsoon, and passing through the strait of Macassar where they are frequently subjected to great detention on account of the light winds and calms.[18]

The information respecting the Philippines collected by Wilkes is to be found in the published reports of the expedition, comprising twenty-four well-printed, quarto volumes. Of especial interest are three chapters by Wilkes entitled respectively, "Manilla," "Sooloo," and "Hydrography of Manilla and Sooloo Sea"; and a chapter by Dana entitled "Geological Observations on the Philippine and Sooloo Islands." Several charts of the Sulu Sea and adjacent waters were published.

Wilkes's visit to Singapore resulted in the acquisition of much information respecting that port and the environing region. On February 26, 1842, he sailed for the United States by way of the Cape of Good Hope, stopping in the Dutch East Indies long enough to make a few surveys. Until the outbreak of the Civil War, he was engaged at Washington in preparing for publication the extensive scientific data collected by him.

With the advent of steamships in the Far East, the island of Formosa, at that time a dependency of China, lying to the southeast of the mainland, assumed importance to the United States as a possible coaling station and commercial depot. Writing in 1856, Commodore Perry, after referring to its advantages for those purposes, called attention to its strategic position, and pointed out that it commanded, not only the principal commercial ports of China, but also the northeastern entrance to the China seas "precisely as Cuba, in the hands of a powerful maritime nation, might command the American coast south of Cape Florida and the entrance to the Gulf of Mexico." Perry urged the establishing of an American settlement at Kilung, on the north coast. A more extreme recommendation was made about the same time by Dr. Peter Parker, our commissioner to China. He proposed that France should take possession of Korea; Great Britain, of Chusan; and the United States, of Formosa, and hold them as hostages until a satisfactory settlement was obtained of all questions at issue between these countries and China.

[18] Wilkes, Exploring Expedition, II, No. 102.

In June, 1849, Commodore Geisinger sent the brig, *Dolphin*, Lieutenant W. S. Ogden, to Formosa, to ascertain whether coal abounded there, and if so what were the facilities for procuring it. Ogden visited several ports of the island and established the fact that it contained coal, but he was unable to inspect the mines, as the authorities refused him permission to do so. The samples of coal which he obtained were tested, and they proved to be of excellent quality. The next naval vessel to visit the island was the ship *Plymouth*, Commander John Kelly, which was sent there in December, 1852, to search for some shipwrecked American sailors, but it failed to find any traces of them. In the summer of 1854 the *Macedonian*, and *Relief* of Perry's squadron, under the command of Captain Joel Abbot, stopped at Formosa, on their way from Japan to China, to make enquiries respecting shipwrecked Americans and to examine the fields of coal. No news of the missing sailors was obtained. Several coal mines, however, were explored by Chaplain George Jones, and the harbor of Kilung was surveyed by Lieutenant G. H. Preble.

In 1857 another search was made at Formosa for shipwrecked Americans by Captain J. D. Simms, of the marine corps, under orders from Commodore Armstrong. Simms spent eight months on the island, traveling from place to place, interviewing the authorities, and mingling with the natives. While he obtained but little news respecting his unfortunate countrymen, he gathered considerable information respecting Formosa and its inhabitants. His headquarters were at Ape's Hill, where the American house of Robinet and Company had a commercial establishment. A brief extract from his narrative dated, December 7, 1857, will give one a notion of his experiences:

During my stay at Formosa I made several trips into the country and was always kindly treated. On the 13th of August last, in company with Mr. Markwald, Esq., the agent of Messrs. Robinet and Co., I visited a Chinese town named Pitow, which is seven miles in the interior from Keow. One road took us through a very beautiful country; on all sides were to be seen luxuriant fields of rice and sugar cane; indigo and hemp were also to be seen amongst the numerous productions of the fertile soil. I never tired admiring the beautiful scenery, and regretted exceedingly that I had not artistical skill sufficient to sketch the picturesque landscape that was presented to my view. We traveled in Sedan chairs carried by Chinese coolies, and were nearly three hours in reaching our place of destination. Pitow is a walled town and contains about seven thousand inhabitants. We went all through it and were kindly treated. The people

crowded about us and regarded us with a great deal of wonder, but their curiosity never led them to be rude. They are very timid, much more so than any Chinese I have yet met with. After spending a few hours looking about the city, we took up our lodgings at the house of one of the officials who treated us very hospitably and gave us a Chinese dinner.[19]

While the increase of knowledge was a secondary object of Commodore Perry's expedition, it nevertheless collected considerable scientific information. This may be found in large part in the second volume of Perry's narrative. Mr. Bayard Taylor, who accompanied the expedition on its first visit to Japan as master's mate of the *Susquehanna,* contributed a paper entitled "Report of an Exploration of Peel Island." There is also in the volume a paper entitled "Geological Exploration of the Great Lew Chew," written by Chaplain George Jones; and there are several papers by the surgeons of the expedition treating of such subjects as the medical topography of Japan, the agriculture of China, the fauna and flora of Great Lu-chu Island, and the Chinese method of hatching ducks.

In August, 1852, Congress passed a law providing for the survey and reconnaissance of the western and northern parts of the Pacific Ocean, and in June of the following year an expedition, under the command of Commander Cadwallader Ringgold, set sail from Norfolk for the scene of its labors. In contained five vessels; the flagship *Vincennes,* Lieutenant Henry Rolando; steamer *John Hancock,* Lieutenant John Rodgers; brig *Porpoise,* Lieutenant W. B. Davis; schooner *Fenimore Cooper,* Lieutenant H. K. Stevens; and storeship *John P. Kennedy,* Lieutenant N. Collins. Ringgold's service as commander of the *Porpoise,* under Wilkes doubtless recommended him as an officer well qualified for the command of an exploring expedition. While he was expected to promote the interests of pure science, his main object was the procuring of hydrographical information for use in the construction of navigational charts for the benefit of American whalemen and merchantmen. He was accompanied by William Stimpson, the chief naturalist of the expedition, and several other scientists.

From the Cape of Good Hope the *Vincennes* and *Porpoise,* under Ringgold, proceeded to Australia and thence to China, making a reconnaissance of sailing routes between those two countries. The rest of the fleet, under Rodgers, sailed for the

[19] East India Squadron Letters, 1857-1858, 254.

Straits of Sunda to make a reconnaissance of the principal thoroughfares in the East Indies. Ringgold arrived at Hong Kong, the appointed rendezvous, in March; and Rodgers, in May, 1854. Here the fleet was forced to remain several months to make repairs. While thus occupied, Ringgold received an urgent request from Commissioner Parker and the American merchants at Canton for protection, since the Chinese Revolutionists were threatening the city, and the steamer *Queen*, detailed by Commodore Perry to guard our interests in that quarter was not considered sufficiently strong to cope with the situation. Ringgold at once responded to the call, and proceeded to Whampoa in the *Vincennes;* and a few weeks later when the outlook appeared more omnious stationed the *John Hancock* and *Fenimore Cooper* off the foreign factories and landed there one hundred and forty-five seamen and marines. The depredations of Chinese pirates also attracted his attention, and he ordered the *Porpoise*, Lieutenant Henry Rolando, to go in pursuit of them. Rolando made three cruises against the pirates, in one of which he rescued a large number of starving Chinese, and in another captured, sunk, or destroyed five war junks.

While directing these operations, Ringgold fell ill with an intermittent fever, which at times wholly incapacitated him for duty, causing a derangement of his mind. During his relapses the command of the fleet devolved upon Lieutenant Rodgers of the *John Hancock*, and Lieutenant Taylor of the *Queen*. On July 17 Rodgers, in consultation with Taylor who was then in command, agreed to furnish Mr. D. N. Spooner, the American vice consul, an escort to Fatshan, a suburb of Canton—Spooner being anxious to determine the military situation of the Chinese forces. On the morning of the following day the gig and launch of the *John Hancock*, under the command of Rodgers, proceeded on this errand. Near Fatshan the further progress of the little expedition was arrested by some armed Revolutionists, and the Americans, unwilling to force a passage, began their return to Canton. At this point an incident occurred which is thus related by Rodgers:

We had pulled a short distance down the stream, when the gig was fired upon from shore with a matchlock, and a shot grazed the cheek of Mr. Spooner taking off a small portion of skin. The shot was returned from both boats and the man who fired from shore was apparently wounded.

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No one else was aimed at, and no other person molested. We quietly resumed our course down the river and pursued it without hindrance.*

This incident assumed great importance to Ringgold, sick, as he was, both in body and mind, and he administered a severe rebuke to Rodgers and preferred charges against him. He also preferred charges against three or four other officers, and several officers preferred charges against each other. The expedition thus fell into confusion, and when Commodore Perry arrived at Hong Kong late in July he did not hesitate to restore order by the use of rather stringent methods. He convened a board of medical officers to report upon the condition of Ringgold, and in accordance with its somewhat extravagant findings directed that officer to return to the United States. He dismissed Ringgold's charges against his officers, placed Rodgers in command of the expedition, and stopped the execution of Ringgold's plans for extensive alterations of the *Porpoise, John Hancock,* and *Fenimore Cooper,* on the ground that they would be expensive and would delay the expedition. By the time Ringgold reached the United States his health had greatly improved, and he at once made a full report in defense of his conduct and in criticism of Perry. At the outbreak of the Civil War he was placed in command of the *Sabine,* and in 1866 he was promoted to be rear-admiral on the retired list, dying in the following year.

The new commander of the surveying expedition, Lieutenant John Rodgers, came from excellent naval stock, his father, Commodore John Rodgers, having served with distinction in our early wars with France, Tripoli, and Great Britain. By the first of September Lieutenant Rodgers had completely reorganized the expedition and was ready to proceed with the prosecution of its work. He sent the *John Hancock,* Lieutenant H. K. Stevens, and *Fenimore Cooper,* Lieutenant William Gibson, to make a reconnaissance along the Chinese coast and to assist the *Powhatan* in conveying Mr. Robert McLean, our commissioner to China, to Peking; while he himself sailed for the Bonin and Lu-chu Islands and the coast of Japan with the *Vincennes* and *Porpoise,* Lieutenant W. K. Bridge. On September 21 the two last-named vessels parted company in the straits of Formosa, and the *Porpoise* was never heard of afterward, in all probability going down at sea.

*Ringgold, C., Report on Movements and Operations of the Surveying Expedition, U. S. Navy Department Archives, "O," p. 5.

With the minutiæ of the work of Rodgers's vessels we are not here concerned. Some incidents that happened at Great Lu-chu Island and in Japan, however, are worthy of mention. In July, 1854, the kingdom of Lu-chu entered into a compact with Perry agreeing to furnish American vessels with refreshments and to pilot them into port. When Rodgers arrived at the island four months later the natives refused to abide by the treaty, and not until he had landed a detachment of one hundred men, with a Dahlgren field-piece, and had made a demonstration before the palace at Sheudi, did they comply with the provisions of the treaty. In southwestern Japan, Rodgers several times went ashore to make observations for the purpose of rating his chronometers. He wrote to the Japanese "secretary of state for foreign affairs" explaining the scientific exigency that compelled him to take this liberty. While the natives at times slightly obstructed his movements they gave him on the whole little trouble, and often supplied him with water and provisions.

In the spring of 1855 the expedition began its most important work, a survey of the waters of Japan and the North Pacific Ocean. From Napa the *Fenimore Cooper* sailed up the west coast of Japan; and the *Vincennes* and *John Hancock*, the east coast. Calling at Shimoda, Rodgers found there at the temple of Yokushen ten Americans—five men, three women, and two children—the men having come to Japan with the expectation of earning a livelihood for their families as purveyors for whaling ships. The governor of Shimoda refused them a residence, declaring that the Perry treaty did not grant them this privilege. Interceding in their behalf, Rodgers wrote to the governor that the Japanese government alone could not rightfully interpret the treaty, that both governments should together agree upon a proper interpretation of it, and that in the meantime the Americans ought to be permitted to live in Japan. The governor refused to accept this view of the points at issue, and the little party left Shimoda, going to Hakodate where they met with a similar reception, and where Rodgers made another appeal in their behalf, but without success. They finally returned to San Francisco in "high and just dudgeon."

From Hakodate the *John Hancock* sailed on a survey of the Sea of Okhotsk; and the *Vincennes* and *Fenimore Cooper* proceeded to Petropavlovskii, Kamchatka, and thence the *Vincennes*

to Bering Sea and Bering Strait, and the *Fenimore Cooper* to the Aleutian Islands and Sitka, Alaska. In the fall of 1855 all three vessels arrived at San Francisco, and in the spring and summer of the following year Rodgers brought the *Vincennes* to New York, calling at Honolulu and Tahiti. This vessel was literally loaded with scientific information. Naturalist Stimpson, it is said, returned with almost five thousand specimens of animal life hitherto unknown to scientists. In 1857 the office of the United States Surveying Expedition to the North Pacific, with Rodgers as superintendent, was established in Washington to publish the results of the survey, and some valuable navigational charts were issued by it. The Civil War, however, greatly interfered with its work, and a complete publication of the scientific information collected by Ringgold and Rodgers has never been made. The Academy of Natural Sciences and the Smithsonian Institution have issued reports on the Turbellaria and Crustacea and the birds. The invertebrate collections, exclusive of mollusks, was almost entirely destroyed by the Chicago fire in 1871. The birds and mollusks are now in the National Museum at Washington.

In 1849 Secretary of State, J. M. Clayton, instituted a mission to Cochin China, Siam, and certain islands of the East Indies, and entrusted it to Mr. Joseph Balestier, at one time American consul at Singapore. It is recollected that Mr. Edmund Roberts had twice tried and failed to negotiate a treaty with Cochin China, and that in 1833 he had succeeded in making a treaty with Siam. This instrument, however, owing to the enormous tonnage duties laid by the Siamese, had proved to be of little or no advantage to our commerce. The duty of conveying Balestier to the scene of his labors fell to Commodore P. F. Voorhees and his flagship, *Plymouth*, in the early part of the year 1850. The mission to both Cochin China and Siam was barren of results. For his failure at the latter country, Balestier was inclined to blame Voorhees, who, one the ground of the prevalence of cholera ashore, refused to furnish the envoy with an escort. Voorhees was sick at the time and did not enter heartily into the plans of Balestier, for whose worth and character he had but slight respect. From Siam the *Plymouth* proceeded to North and South Natunas, Subi Island, Sarawak, the island of Labuan, and the city of Borneo or Bruni. At the last-named place Balestier negotiated a commercial treaty with the Sultan of Borneo.

In 1856, the flagship *San Jacinto,* wearing the broad pennant of Commodore Armstrong and carrying on board Consul-General Townsend Harris, visited Siam to make another attempt to negotiate a treaty with that country. Harris was cordially supported by Armstrong, who, with a party of officers and a marine guard, accompanied him to Bangkok and appeared with him at the court of Siam. In no small part as the result of Armstrong's co-operation, the efforts of the envoy were successful, and a new treaty was negotiated. The duty of carrying the ratified treaty to Siam in the following year fell to the *Portsmouth,* Commander A. H. Foote. While that vessel lay off the Menam River, she was visited by the "second king" of Siam and a suite of some twenty princes and nobles. The king said he was the first Siamese ruler to go aboard a foreign ship of war. He was honored by the firing of a royal salute, the manning of the yards, and the exercising of the crew at general quarters.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A COMPARISON BETWEEN AMERICAN AND BRITISH LANDING FORCES ASHORE WHILE PERFORMING THE SAME DUTY.

By Ensign Charles McKenna Lynch, U. S. Navy.

The impressions related in this article were obtained while ashore with landing force in Ceiba and Puerto Cortez, Honduras, during the recent revolution in that country.

The forces were from the U. S. S. *Marietta*, commanded by Commander G. F. Cooper, U. S. N., the U. S. S. *Tacoma*, commanded by Commander A. H. Davis, U. S. N., and H. B. M. S. *Brilliant*, commanded by Captain Woolcombe, R. N.

At Ceiba the landing forces were not combined, each force had its own barrack, but as the barracks were within 75 yards of each other, and the men were doing the same work there was ample opportunity to compare them.

At Puerto Cortez, Honduras, Lieutenant M. B. F. Colvile, R. N., an excellent officer, and I had our forces in the same barrack, and as the officers stood watch and watch for six days, the officer on watch being in command of both forces, the opportunity for comparison was excellent.

The petty officers on watch also had joint command—that is, at one post there were three American and three British bluejackets in charge of a British petty officer, and at another post the same number of men of each force in charge of an American petty officer, etc.

As the impressions given are entirely my own I shall first state my opinions and then attempt to show upon what they are based.

To better understand the comparison it is necessary to state that *all* of Lieutenant Colvile's men had been in the service for over three years, and that only two of our men had been in the service over three years; in fact 25 per cent of them had been in

the service for less than a year and had never been on any other ships.

The British bluejackets are older, bigger, stronger, more healthy, more obedient to petty officers, more experienced and take better care of their equipment than American bluejackets.

The American bluejackets are cleaner, better equipped, better fed, of more intelligence, and far more ingenious than the British bluejackets.

To the first statement that the British bluejackets are older, bigger, stronger and more healthy, no incidents can be stated to prove it, but it was a very evident fact. Every officer who has had the same men under him for two years can recall how greatly the men improved physically, so it is easy to understand why their men are better physically than ours,—they have a 14-year enlistment.

Quite often we hear the charge that there is better discipline in the British Navy than in ours. If this is true then the men from the *Tacoma* are better disciplined than our average, or the *Brilliant's* men are not so well disciplined as their average, which I do not believe.

When a British officer calls a man or sends one on a message the man moves on the run. So does a man from the crew of the *Tacoma*. Perhaps this is not the case on all ships in our navy while it is so in the British Navy. In our navy it more or less depends on the commanding officer; in the British Navy it is universal custom. It is true though that a British bluejacket is never so excited or so much in a hurry as to forget to salute or stand at attention.

Not a man in either force showed the slightest sign of sulkiness, disrespect or questioned for an instant an order from either officer. There was only one case of misconduct, and it was not by our men.

British petty officers command obedience *nearly* as well as commissioned officers, and it was very noticeable. They commanded better obedience from our men than our own petty officers did, and the British bluejackets were quick to learn that our seaman petty officers lacked force.

Our petty officers were not A No. 1 men, while Lieutenant Colvile said his were excellent. Line officers will understand immediately the type of senior petty officer we had on learning

that the petty officer in question had been a coxswain for six years and was promoted for obedience and faithfulness. His faithfulness, by the way, brought to our notice the case of misconduct referred to.

The British showed their experience in many ways:—they never forgot to fill their canteens (our men did not either after they had stood four hours in a terrific sun with an empty canteen); they knew how to rig and care for mosquito nets; they changed clothing after being in the rain; they had stood a watch in three before and slept when off watch; our men played baseball or the graphophone.

Again in the manner of handling a loaded gun their experience was evident. The nature of the patrol duty rendered it necessary to carry the magazines loaded, magazines had to be uncharged before entering the barrack. This caused me considerable worry, especially at night in the rainy weather, and I made it a point to be present in order to inspect the pieces to prevent accidental discharge. Lieutenant Colvile had no anxiety on this point at all, saying that his men were used to handling loaded guns. When he was informed that most of our men had been in the service less than a year he was simply astounded and really doubted it. There were no accidental discharges by our men.

In regard to cleanliness our men are far superior. In fact the only complaint our men made was one day when they were not allowed to scrub clothes, and though they were informed that allowance would be made for dirty clothes they were uneasy, and when hands were called for they inspected each other and sent the cleanest. Another example of this was showed at San Pedro. The men arrived there after dark, having been on the trains all day, 75 per cent of them had a watch that night and at 6 o'clock the next morning 150 feet of line was covered with scrubbed clothes, and reveille had not gone.

The British bluejackets were very quick to notice this. At quarters our men were cleaner and neater looking.

Our equipment is better looking and more serviceable than that of the British.

Our working suits are quite white, the British working suits have a grey tinge, causing them to appear soiled.

Our leggings, haversack, knapsack and belts are of better material than theirs, and have the advantage of being of material that can be scrubbed.

Their canteens are of the same type as ours, but are slung badly, dead astern, and therefore when a British bluejacket wants to drink from his canteen he gets some one to unsling it for him. This is not absolutely necessary, but is much easier.

They have no ponchos, or anything to take their place.

British bluejackets take better care of their outfit than our men do, and in general are much less destructive. For example: Two extra men arrived, one American and one Britisher, and no place had been assigned for their gear. The Britisher stood by with his in hand, the American went outside, yanked some nails out of a board walk, ruining the walk, drove the nails in the wall, defacing the wall, hung up his gear and passed the time in feeling sorry for the Britisher.

Our ration is more plentiful and more varied, and our men live at least 25 per cent better than the Britishers. Our men get all they can eat and have some left over, the Britishers get enough and never have any left over. Both forces have food of excellent quality. The British serve cocoa for the night watches in lieu of our coffee.

In the beginning it was stated that our men were more intelligent and more ingenious. They certainly look more intelligent, but that is not a positive criterion. Their men are enlisted from the laboring classes, and it is very evident that mighty few have had the advantage of public schools or comfortable homes.

At Ceiba it was necessary to build a stockade for the protection of the people in the neutral zone.

The Britishers built one, and a good one, but they labored very hard, doing all their own work, hauling sand by hand, and using their own tools.

We got an engine and eight cars, rounded up about 100 natives who were to take refuge in the neutral zone, and made them work, got tools and sand bags from people ashore, and were finished two days before the Britishers.

As a rule officers in the British Navy do not accept suggestions from their men, and, as a result, none are offered. We were engaged in a work that was new to us all and many valuable suggestions were received from the men.

A rather amusing case of ingenuity was the following: One of our men had been sent on a message to a point two and a half miles distant and returned in less than an hour. On being asked

how he accomplished it so quickly he replied, "Well, I saw a horse adrift, unrigged a clothes line in some one's yard, lassoed the horse, made a bit and bridle, and rode. It's a fine horse, come out and I'll *let* you ride him, sir." The last remark greatly shocked the Britishers.

Puerto Cortez was under martial law, no one allowed on the streets armed, and no one allowed to go out at all after 9 p. m. While on patrol the men of both forces were a credit to all. They were courteous, respectful, firm, and absolutely fearless, never hesitating an instant to tackle a situation single handed which might require re-enforcements.

At Ceiba our men had occasion to leave the stockade to drive an armed force from the neutral zone, and all were very eager to go though the bullets were whistling rather carelessly. The British had no occasion to leave their stockade, and their men and officers envied ours very much.

On another occasion Captain Cooper gave me permission to shoot, with intent to kill, at a soldier hidden in the bush, who was intentionally or unintentionally landing a shot about every minute in our vicinity. Every man wanted to go and those that did go were greatly chagrined that the sharpshooter (?) had ceased his firing and beat a hasty retreat as we entered the bush.

The men of the two forces were very friendly, and I am quite sure that all hands enjoyed each others' company very much and profited by it.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SWEDISH SYSTEM—A FURTHER PLEA FOR PHYSICAL TRAINING IN THE NAVY.

By CAPTAIN A. C. NIBLACK, U. S. Navy.

In " A Plea for Physical Training in the Navy," published in No. 129 of the NAVAL INSTITUTE PROCEEDINGS, the writer dealt with gymnastics, athletics, and voluntary physical exercise on board ship, but did not touch upon the Swedish system because:

1st. It seemed too complicated, and required too much time for use afloat, and

2d. It necessitated trained physical instructors on board ship.

It is, however, impossible to get something for nothing, and in the compulsory application in our navy of the Swedish system, so successfully used in several European armies and navies, we have the best and most practical solution of the problem of the physical fitness of the navy personnel. There is nothing experimental about it, and it involves the least expenditure of time and money.

The Swedish system of physical training has for its object not the development of athletic stars, but the development of the deficient, so that the physically poorest officer or enlisted man may be what the average athletic person is now under no system at all. As used in the British Navy, it is embodied in three books, viz.: " Handbook of Physical Training," Vols. I and II, and " The Principles and Practice of Educational Gymnastics." These splendid books might well be adopted outright in our navy, but, to save time and get better practical results, there should be not only some slight simplification of the British adaptation, based on their own large experience, but we should also embody in the system certain features of the American adaptation of the Swedish system now so signally successfully in the gymnasium of the

muscles as possible, aiming thus to localize the will and to trai co-ordination. Music as an accompaniment to exercises cann be used in the Swedish system, and is in fact forbidden.

The exercises of the Swedish system are divided into grou according to their effects on the different groups of muscles, an not according to any apparatus which involves many groups. Th exercises merge into each other, however, and facilitate th passage from one exercise into another. Exercises from th following groups, according to the time available, constitute day's lesson, but the idea is to carry all of them out in sequen in each daily lesson, whenever practicable.

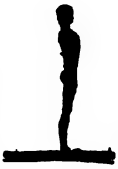
1. Leg exercises.	6. Abdominal exercises.
2. Span bending exercises.	7. Lateral exercises.
3. Heaving exercises.	8. Jumping and vaulting.
4. Balance exercises.	9. Breathing exercises.
5. Dorsal exercises.	10. Marching and running.

Surgeon H. B. Hill, of the British Navy, is of the opinio that the physiological effects of leg exercises in their "defle tive" effect, and of breathing exercises in steadying the acti of the heart, after violent exercise, are ineffective and illuso Probably no one is better qualified to pass such opinion, since h experience has been exceptional. He is also of the opinion th the so-called "corrective" exercises are tedious and ineffecti and tend to kill interest. These opinions show the possibility saving a lot of time now wasted in "corrective" work and "finishing" exercises, and bringing the classes more quickly the jumping and vaulting.

For the benefit of those who may not be familiar with th Swedish system and may wish to get some idea of it, illustratio of several characteristic easy and difficult exercises of the abo groups are herewith given, representing the extremes in the ex ercises.

Every exercise is carried out from a distinct "starting posi tion," which is based upon the "fundamental positions," an each "starting position" is taken accurately by separate com mand, and is either carried on to a "finishing position" or re turns to the "starting position." A finishing position may b the starting position for some progressive and more diffic exercise.

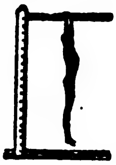
FUNDAMENTAL POSITIONS.



Standing.

Sitting.

Lying.

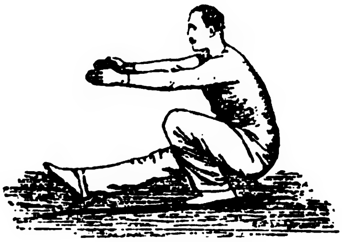


Hanging.

Kneeling.

1. LEG EXERCISES.

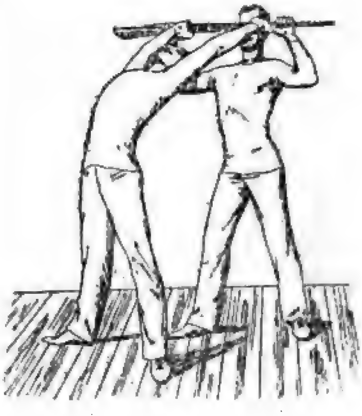
Heel Raising and Knee Bending.



Knee Bending.

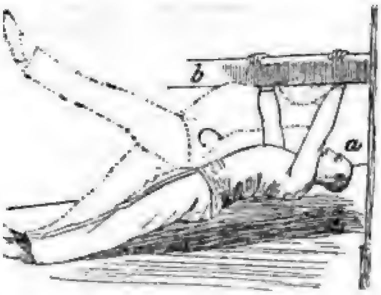
2. SPAN BENDING EXERCISES.

Trunk Bending Backward.



Span Bending. Live Support.

3. HEAVING (HANGING) EXERCISES.



Fall Hanging.

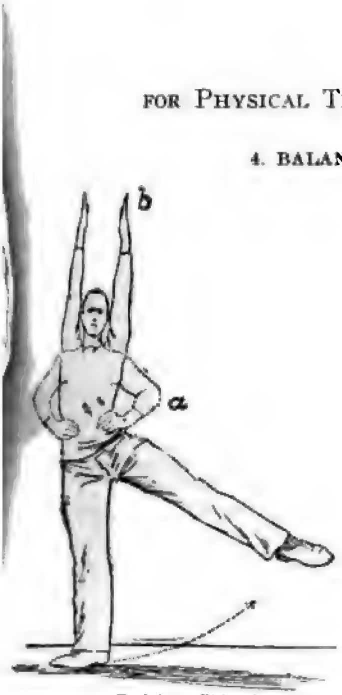
Plumb Hanging

Side Travelling.

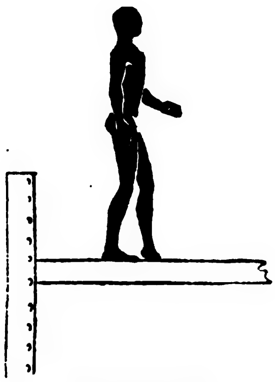
Alternate Grip.

Alternate Grip.

4. BALANCE EXERCISES.

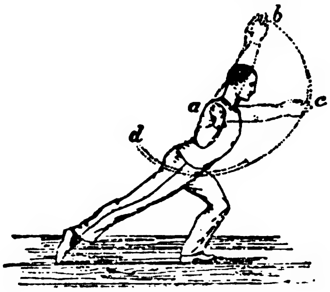


Leg Raising Sidewise.

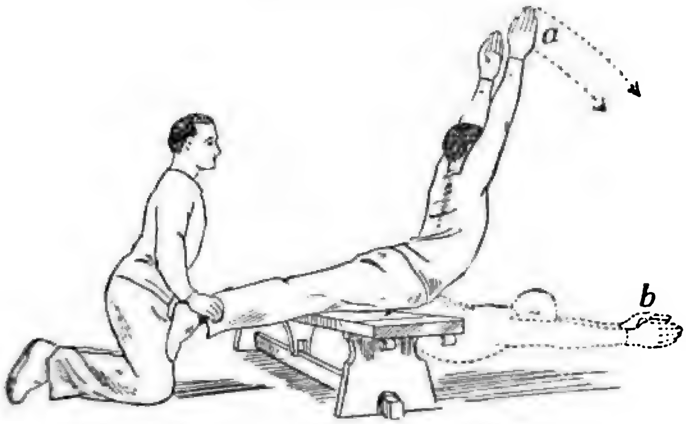


Balance Standing

5. DORSAL EXERCISES.

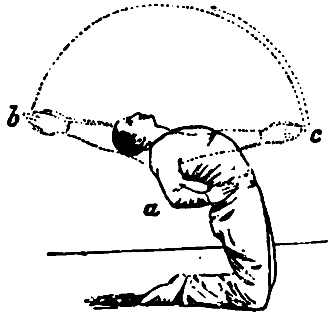


Arms Stretching Upward.

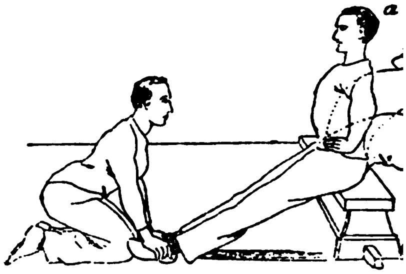


Forward Lying. **Trunk Bending Upward.**

6. ABDOMINAL EXERCISES.



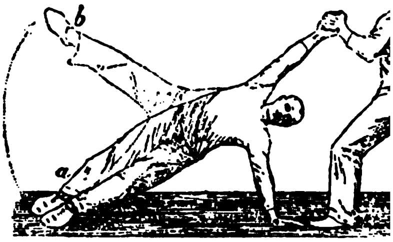
Kneeling. Arms Swinging.



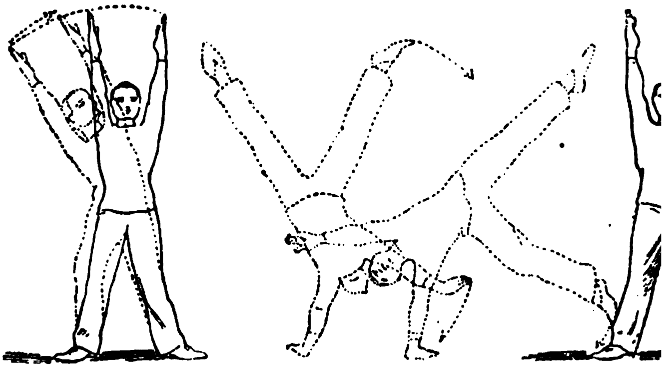
Sitting. Trunk Falling Bacl

7. LATERAL EXERCISES.

Side Bending.

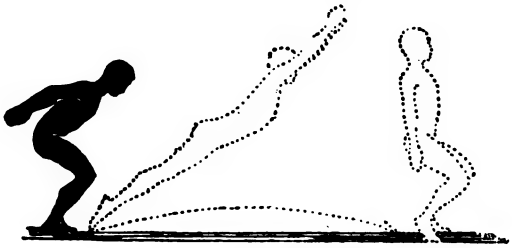


Side Falling. Legs P

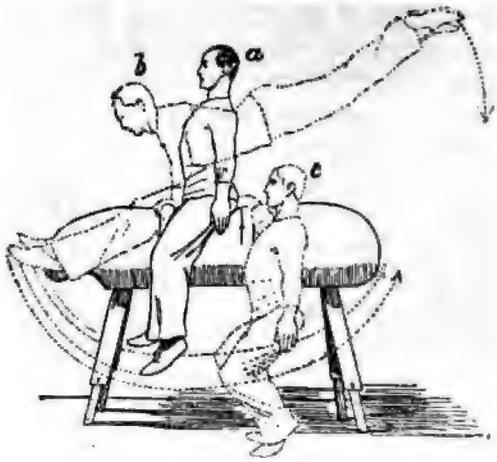


Lateral Exercise. Wheeling.

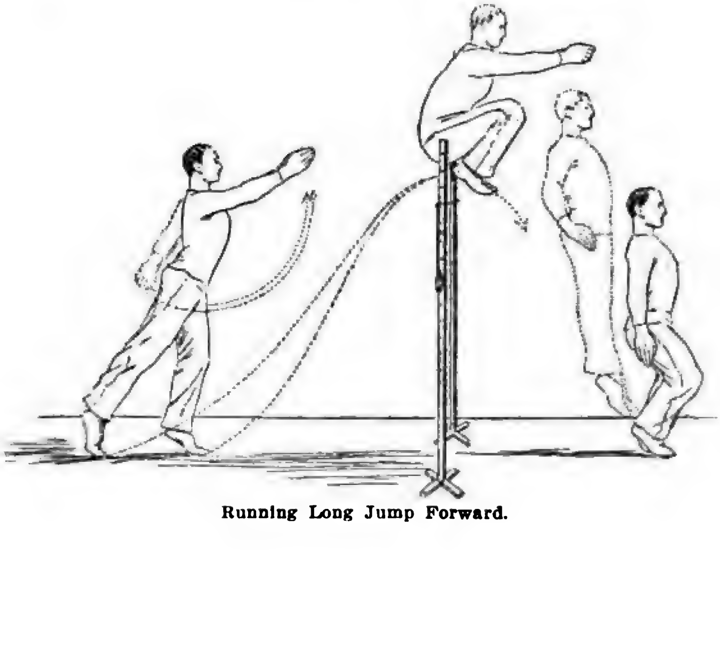
8. JUMPING AND VAULTING.



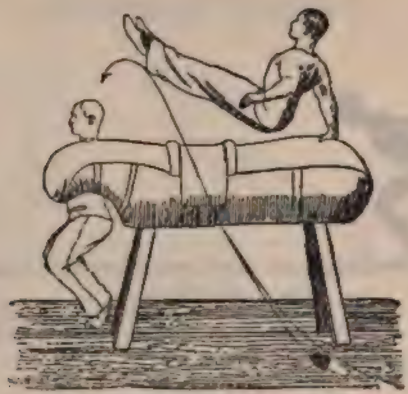
Long Jump Forward.



Horizontal Vault. Ride Sitting.



Running Long Jump Forward.



One-Hand Side Vault.

Handspring (Long Box).

It is not necessary to illustrate "9. Breathing exercises," "10. Marching and running," as they are well understood.

The apparatus used ashore at training stations, and whi may be improvised or taken on board ship, consists of:

(a) A vaulting horse with adjustable legs.

(b) A pyramidal long box. (Shown in "Handspring.")

(c) One or more sets of wall bars. (Bar stalls.)

(d) A moveable or sliding horizontal bar or cord. (See "Ru ning long jump forward.")

(e) Two sliding beams, two inches thick and six inches deep (or wide), supported between two posts with iron pegs for shifting positions up or down. (Shown in "Balance standing" and not usually used on board ship.)
(f) Parallel bars.
(g) Ropes.
(h) Swinging rings.
(i) Mats for deck.*

GYMNASIUMS.

All gymnasiums in the United States, with their costly apparatus, more or less fail in their real purpose through the jumbling of different systems and apparatus, with consequent confused ideas and go-as-you-please methods. A proper testing machine would clear all this up as hereafter shown.

In Germany, at the beginning of the last century, the gradual introduction and development of gymnasiums in connection with schools became a national movement through the genius of Jahn, who organized societies; invented horizontal and parallel bars; added varied and systematic exercises; and became, as it were, the father of modern gymnastics, and the founder of the Turner movement so widely known to-day in the Turn-verein. This system appeals to the play instinct, and nurses and stimulates all the motions of play, while at the same time it gives needed exercise. Each person, however, starts in gymnastic work *where his physical abilities permit.* There is of course much system in it, but it tends to overstraining, because the work is largely voluntary, showy, and competitive. At the same time that Jahn and others developed gymnastics in Germany and elsewhere Ling (born 1776—died 1836) founded the Swedish system which is the most definite form of physical training which has yet been evolved.

* The best mat is made from hammock mattresses, each one being covered with a canvas mattress cover for removal and scrubbing, and each cover fitted along its entire lower edge with a narrow strip with eyelets for lacing the unit mats snugly together to form any rectangular shape desired. The slit for removing the mattress from the cover should be on the under side, so that the whole top surface shall be smooth. Three mattresses can be made up into two ticks so as to get greater thickness, if it is desired. The unit idea gives the advantage of storage; of cleanliness by scrubbing; and of facility for drying if accidentally wet. It also permits changes in shape to suit various purposes.

In the United States the German influence has led to the estab lishment of gymnasiums in connection with most of our larg schools and colleges, and the Y. M. C. A., movement has adde to these numbers in our cities and towns by the hundreds. Th chief influence which has latterly differentiated the Americ gymnasiums from the German type has been the Harvard systen The German equipment consists largely of parallel bars, hor zontal bars, rings, trapeze and vaulting horses which involv "moving exercises," and dumb-bells, Indian clubs and wand which are used in "place exercises." For the purpose of sym metrical and systematic physical development, Dr. Sargent a Harvard College, in 1869, gave an impetus to an improved syste of gymnasium equipment which, starting with chest weights, ha resulted in the addition to the typical gymnasium equipment o neck, leg, wrist and ankle machines; high and low pulleys; row ing machines; abdominal machines; and very many others, whic may in contradistinction to the German apparatus be designate as "side-wall machines" on account of the way they are general erected for "place exercises" whereas the German apparatus usually in the open because used for "moving exercises." Th object of the side-wall machines is to furnish means to selectiv build up certain weak, relaxed muscles, or groups of muscles, a definite exercise, i. e., by "local application." The object these is of course to supplement other gymnasium work, not replace it.

The Harvard system, while complicated by what may be call laboratory research, takes its practical form in (1) physic measurements, such as the circumference of the upper arm, for arm, neck, chest, waist, thigh, calf, breadth of shoulders, depth abdomen, and lung cubic capacity, and (2) certain individ strength tests, such as grip, number of times "pull-up" an "push-up," strength of back, strength of legs, etc. From the a chart is built up and a formula given which in an indirect wa are supposed to indicate to each individual who has been meas ured and tested, the necessity for him to take up certain exerci on the side-wall machines to make good the defects indicated b the chart, which chart is based upon thousands of average physic measurements and tests. This method is a practical failure, be cause it is vague and misleading. Meanwhile at Battle Creek Michigan, Dr. J. H. Kellogg, a close student and practitioner o the Swedish system, perfected a dynamometer which has for i

object the testing of various groups of muscles of the arms, legs, chest and trunk by isolating them during each test in strict conformity with the principle upon which Ling built up his system. From the test of hundreds of people, charts have been made and variations from the average which show defects are made good in the gymnasium by side-wall machines which are numbered and shown on the chart opposite the groups of muscles tested. It would seem that the Harvard system, after achieving so much, has fallen short in that the prescription for exercise can only be vaguely indicated, whereas by the Kellogg method it is practically automatic and almost absolute. In proportion as the Harvard system has consciously or unconsciously differed or departed from the Swedish system, it has proven a failure. The "pull-up" test, for instance, under the Harvard system, consists in "dipping" on the parallel bars as many times as possible. This movement is specifically forbidden in the Swedish system because it pulls the shoulders forward, flattens the chest and generally deforms the body. The Harvard system was introduced at the United States Naval Academy in 1903 and was replaced in 1909 by the Kellogg system, which is in effect the a-b-c of the Swedish system of physical *development*.

The safe and sane principle embodied in the Swedish system is the prevention of overstraining, which is the radical fault in the German system, and any other than the Swedish system, which latter does not involve constant medical supervision by a trained physician. The reason for this is that the system guards against overstraining by gradual progression, and the trained instructors, with this in view, are not permitted to deviate from definite sequences, progressions, rules and methods. It therefore guarantees results without the aid of elaborate apparatus, and at a minimum cost. Considering the millions of dollars invested in gymnastic apparatus in the United States, the actual good accomplished, when off-set by the injury done to individuals by injudicious exercise, would seem to indicate that the average gymnasium is not a paying investment, except where it is in charge of trained physical directors or instructors or of a trained physician, or where it is operated on the Swedish system in conjunction with a testing machine. The adoption of the Swedish system in its *full* scope, however, in Y. M. C. A. and public gymnasiums is not practicable as it is too rigid and difficult, but a modified form is practicable. For schools or military bodies in

which discipline is *effective,* and where the results can be guaranteed, the system can be made effective and remarkable results obtained.

The astounding adaptation of the heart in childhood to the strain put upon it, points to the fact that jumping, walking, and running with a few corrective exercises in carriage of trunk and chest, are all that should be undertaken with children, as these exercises tend to develop the frame (skeleton) better than the muscle. Horses are raced at two years of age with no bad results. Put them to the plow at this age and you ruin them. Back of all this is the latent fact that runners or sprinters are either born or are developed as such in childhood, since there is no regular recognized build or form for running. Some people can simply run fast, and others cannot.

In youth the period of anatomical or skeleton development does not correspond with actual age, and in fact varies with each individual. It is seriously argued, under the Harvard system, that for this reason any system of training rightly conceived must be based upon a study of the individual. It is therefore argued that laboratory experiments are necessary in order to group students according to their bone development, and hence their need for exercises. Expert trained physicians are therefore necessary at every hand to determine physical requirements. As a matter of solid fact the best results in physical training, under the Swedish system, take place during youth, because at this period the natural growth and development can be powerfully aided and directed in building up a perfectly formed and healthy body by the scientific application of physical exercises, and the advice and consultation of trained physicians are not required. In fact the neglect of proper exercise at this period frequently results in a flat chest round shoulders, poor physique, clumsy and ill-controlled movements, with their sequels of organic weaknesses, predisposition to disease, and lack of efficiency, leading to the inevitable medical survey. *These defects are, moreover, very little amenable to physical correction commenced later in life.*

In fact the problem in the navy is to correct in otherwise healthy young men who enter the service those defects resulting from arrested development, and from incorrect attitude due to work which has left its impress in characteristic lack of symmetry, and in poor carriage. Attitudes necessitated by prior occupations have become somewhat fixed. Unequal muscular devel-

opment, through certain occupations, has resulted in an apparent shortening of the much-used muscles, causing a strong pull which warps the carriage of the body. It is in this view of applying exercise to the weaker counter-muscles that the Kellogg Universal Dynamometer finds its place at the Naval Academy and at training stations, as it clearly and quickly indicates faults in development for which the "side-wall machines" furnish the *tentative remedy*. The real remedy is in the all around exercises of the Swedish system. The Harvard system thus again leads us astray by seeming to suggest, on account of bone development, that the age of entry in the navy should be raised, whereas it would be better to lower it for midshipmen and probably also for enlisted men, and enter them younger than under present laws, in order to mould them better to naval needs.

The whole trouble with systems which, like the German, are founded solely on gymnasium work, is that the acquisition of skill in the performance of tricks on particular apparatus, which is erroneously accepted as the meaning of the word "gymnastics," cannot give the desired result of even development of the body. Such exercises conceived as an end in themselves are adapted to the construction of the apparatus and not to that of the human body. Therefore while the practice of such exercises in moderation by those of *mature development* is unobjectionable, their excessive or constant practice especially in *youth* leads to over-development of one part of the body at the expense of the remainder with the risk of injury to vital organs. At any age the acquirement of great muscular development without the corresponding development of the vital organs will lead to injurious results especially to the heart through the excessive work required of it to drive the blood through the abnormal mass of muscle. The evil effects of these different forms of defective development may not be immediately apparent, and in fact may seem to be wholly absent, but in time they will show themselves by the premature failure of some over-developed or overstrained organ to do its proper work. Then comes the unjustifiable criticism of any form of exercise which is invariably made by those who, satisfied with a life of self-indulgence and ease, are too ready to seek excuses for what in their hearts they know to be contrary to the laws of nature. It must always be maintained by precept and practice that the purpose of physical training is the uniform development of every one. The few who show exceptional ability

are not to receive attention at the expense of the remainder. The development of stars is the curse of athletics as a general means of physical improvement.

It is hoped that the period of general training at the various training stations from time of enlistment to drafting for service afloat may be increased to at least six months. In the British navy the recruits are at the depots about one year. In our navy the period has averaged in recent years about four months. It is at the training stations that recruits should receive thorough individual examination by medical officers with a view to remedying any slight congenital defects and correcting acquired ones. This is the great field for the activities of the medical corps where much of the waste from subsequent medical surveys for physical disability will be checked, especially if physical development and training are properly carried out during the entire period. Less than half an hour a day for five days in the week would be required for this all-important purpose, medical officers, however, taking all the time necessary from this and other periods, to properly examine individuals.

DR. J. H. KELLOGG'S ADAPTATION OF THE SWEDISH SYSTEM.

As previously stated the Universal Dynamometer, illustrated in No. 129 of the PROCEEDINGS, perfected by Dr. J. H. Kellogg, was designed to localize the test of muscles or muscle groups under the Swedish system, by isolating each muscle or group when tested, the object being to obtain a prescription to enable the physical instructor to intelligently correct the more marked individual physical deficiencies while carrying on the general development of the individual along with a large number of other pupils. The test is made of 20 groups of different right and left muscles, and six trunk and neck muscles (or about 46 muscles or groups of muscles in all). By testing many hundreds of people a series of charts is obtained giving the characteristics of the average person arranged according to height in half inches. The various "side-wall" appliances in gymnasiums are numbered in such a way that any marked deficiency in all-around physical development may be remedied by working on the machines whose numbers are given on the chart opposite the particular group of muscles in which marked deficiency from the average is shown by the test. This system therefore connects the "side-wall" machines directly with the testing machine. It does it almost

automatically. The corrective exercise must be light, gentle and gradual. It must not call for any marked acceleration of the pulse or breathing, cause any heart distress, or in any way strain any muscle. When the particular muscle or group begins to "burn" or tire the exercise stops. A subsequent test reveals the progress made and the deficiency remedied. It is the mere a-b-c of symmetrical physical development and bears no real relation to physical training, to endurance or to athletics. It is merely a guarantee that the raw material is good.

In Appendix A is given the physical chart made at the U. S. Naval Academy from the test of 1000 midshipmen classified and arranged according to heights in half inches from 62 to 74.5 inches. It will be noted that the muscles are classified under arms, legs, trunk and chest. No person is ever found who corresponds with the average. The curve of each individual is a very erratic zig-zag line which graphically indicates variations above and below the average or normal, by the amount to the right or left of the vertical line drawn to represent the height. No anthropometric or laboratory investigation is as *practical* and satisfactory for ascertaining in a limited way the muscular needs of an individual. No harm can at least be done the individual, and when one has removed harm from physical exercise he has cleared the way for benefits. Coupled with this physical test is a complete set of anthropometrical measurements—much more complete in fact than under any other system. It is merely that tape line circumference of muscles is not an index of the muscles' capacity for work or need of exercise, and it merely goes to show that any system of prescription for exercice based on anthropometric measurements is sufficiently vague to be unscientific. In the hands of a trained physician relying on personal diagnosis, any system will answer. In a military system where strict physical examination precedes acceptance and where there are thousands of recruits, an automatic system is *essential* and nothing else will answer, because after all it merely assures a reasonable average physical *development* as a basis for real physical *training*, thereby saving much time as all start fair in training. *It must not be mistaken in any way for physical training itself.*

It is both interesting and instructive to analyse the tabulated results of the chart referred to (Appendix A.) This chart and others compiled elsewhere show that the total strength of average men varies as the square of the height in inches, and that it is

therefore unfair to compare the strength of any one with another whose height is not approximately the same. The laws of physical development connect large muscles with large bones. The strength of a muscle varies as the area of its cross-section, and the cross-section varies as the height of the person. However, as areas vary as the square of the radii of circles of same area there is a reason in theory as well as in practice for the total strength varying as the square of the height in inches. The difference in the height of tall and short men is, however, chiefly in the greater proportional differences in the length (and hence in the strength) of their legs. In the total strength of the entire body the chest tests average eight per cent of the total; the trunk 20 per cent; the arms 28 per cent; and the legs 44 per cent. Leaving aside physical endurance, which is, however, the *all-important* physical test, these percentages represent in team athletic contests in general about the relative importance in these contests of the above sub-divisions of the body. In spite of this the compelling fact remains that in physical culture what promises the longest and most useful careers is work to develop the chest, abdomen and trunk, containing, as they do, the vital organs. One may neglect somewhat the legs and arms in after life, but health demands that work on the chest and trunk be continued to the end which it tends to postpone a number of years beyond the so-called allotted span.

A close study of the physical chart reveals many surprising facts. For instance the strongest group of muscles is the back with which the chart shows the average young man can lift about 400 pounds dead weight. The chart also shows that with each foot extensors (the muscles by which a person rises on his toes) the average young man can lift a weight on his flexed knee of quite 350 pounds, that is to say, in each of his legs singly he is nearly as strong as he is in his back, but whereas it is most difficult to add by training to the amount one can lift with the flexors, it is not difficult to increase the amount one may easily lift with the back, the reason being that we are daily using our leg muscles and seldom lift objects. However, aside from the deductions from physical tests by machines some small men can easily overcome large men physically, because of training and endurance.

At the U. S. Naval Academy all midshipmen are tested by the dynamometer when they enter. If deficient they go in the "weak squad," and while others are enjoying voluntary athletics in the

open, they work on the side-wall machines in the gymnasium until they round out their physical development, and can pass the practical examination which the dynamometer provides. This test appeals to the two prime incentives, stimulation to not be in the "weak squad," and emulation to beat the other fellow. No one can strain himself to injury as only a single group of muscles is exercised or tested, and the chart connects each group of muscles with the numbered machines. You can almost pick your foot ball players and race boats' crews from the physical charts. With this system everything is definite and practical. You get just what you want and need, and you know when you have gotten it, and can measure the progress and the amount. The strength thus gained, however, has no relation to *endurance.* That comes with training and diet.

When a midshipman passes the test as to physical *development* he then, and only then, becomes available for training in the gymnasium, and in that status all are on the same plane, and progress can be made safely and rapidly.

It would be well to introduce this system into the training stations, and to keep the "weak squad" on shore until they qualify. The Swedish system should also be put into effect at the Naval Academy as well as at the training stations. As soon as a corps of petty-officer instructors is developed the system should be put into effect afloat.

It should be kept in mind that the testing machine and side-wall apparatus will shorten the preliminary period of development and bring the deficient forward quicker and better than by any known method, thus begining *training* sooner than is practicable where, as in the pure Swedish system, the deficient keep back the progress of the well developed, and kill their interest.

The Universal Dynamometer is an automatic gymnasium director. It is sound in principle, and a great time saver. In connection with the Swedish system, it offers us just what we need. Any one who will take the trouble to see what a revolution it has wrought at the Naval Academy will endorse all that has been here said in its favor.

		19	19	19	19	19	Classified and Arranged						
	Age												
	Height						62	62.5	63	63.5	64	64.5	65
	Weight						116	118	120.5	122	123	128	132
Arms.	R. Hand Flexor						94	97	100	102	105	109	111
	L. Hand Flexor						89	92	94	97	100	101	104
	R. Hand Extensor						35	36	37	38	39	40	41
	L. Hand Extensor						30	31	32	33	34	35	36
	R. Forearm Pronator						59	61	62	64	65	66	68
	L. Forearm Pronator						50	52	54	56	58	58	61
	R. Forearm Supinator						40	41	42	43	44	45	46
	L. Forearm Supinator						35	36	37	38	39	40	41
	R. Arm Flexor						64	66	68	70	72	74	76
	L. Arm Flexor						64	66	68	70	72	74	76
	R. Arm Extensor						79	80	81	83	84	85	86
	L. Arm Extensor						75	78	80	82	83	84	85
	R. Latissimus Dorsi						100	103	106	108	110	111	113
	L. Latissimus Dorsi						99	101	104	106	108	109	112
	R. Deltoid						56	58	60	62	65	68	70
	L. Deltoid						54	56	58	61	65	68	70
	R. Pectoral						82	84	86	88	90	93	94
	L. Pectoral						79	82	84	86	88	90	92
	R. Shoulder Retractor						75	78	80	83	65	85	88
	L. Shoulder Retractor						70	72	74	76	80	82	84
Legs.	R. Foot Flexor						65	66	67	68	69	70	71
	L. Foot Flexor						61	62	63	64	65	66	67
	R. Foot Extensor						302	306	309	312	315	319	323
	L. Foot Extensor						297	300	302	308	310	313	320
	R. Leg Flexor						100	102	104	106	108	109	111
	L. Leg Flexor						95	98	101	103	105	107	108
	R. Leg Extensor						120	125	130	133	135	137	140
	L. Leg Extensor						115	120	125	130	133	135	137
	R. Thigh Flexor						140	142	145	148	150	152	155
	L. Thigh Flexor						135	138	140	143	145	148	150
	R. Thigh Extensor						132	136	140	143	148	149	152
	L. Thigh Extensor						130	134	137	140	145	146	148
	R. Thigh Adductor						97	102	105	108	112	115	117
	L. Thigh Adductor						96	99	102	105	108	110	112
	R. Thigh Abductor						83	86	89	92	95	96	98
	L. Thigh Abductor						82	85	88	91	94	96	98
Trunk.	Trunk Anterior						150	153	157	160	163	169	174
	Trunk Posterior						350	358	355	358	360	363	365
	Trunk R. Lateral						150	153	155	158	160	161	163
	Trunk L. Lateral						145	148	150	153	155	156	158
	Neck Anterior						52	53	54	55	56	56	57
	Neck Posterior						68	70	71	73	75	75	77
	Neck R. Lateral						58	59	61	62	64	65	65
	Neck L. Lateral						58	59	61	62	63	64	64
Inspiration.	Inspiration—Chest						275	280	285	290	295	300	305
	Inspiration—Diaphragm						200	204	208	212	216	220	224
	Spirometer—cu. inch						200	205	210	215	220	225	230
Total Strength.	Arms						1339	1356	1391	1438	1470	1504	1542
	Legs						2048	2101	2147	2194	2236	2268	2306
	Trunk						1031	1048	1064	1081	1096	1109	1128
	Chest						475	484	493	502	511	520	529
	Entire Body						4893	4989	5095	5210	5313	5401	5500
	Height						62	62.5	63	63.5	64	64.5	65

Numbers opposite muscles

ICAL CHART.

—74-5 in. Arranged from Results Obtained in Testing 1000 Midshipmen.

....Class of ....

69.5	70	70.5	71	71.5	72	72.5	73	73.5	74	74.5	Apparatus.
148.5	150	153	155	158.5	160.9	163	168	170	171	178	
127	129	132	135	136	138	140	144	146	150	152	1.2.3
125	126	128	132	133	134	138	139	141	144	148	
50	51	52	53	54	55	56	57	58	59	60	1.6
45	46	47	48	49	50	51	52	53	54	55	
80	82	82	84	85	87	88	90	91	93	96	4
73	75	76	78	78	80	81	83	83	86	89	
55	56	57	58	59	60	61	62	63	64	65	4
50	51	52	53	54	55	56	57	58	59	60	
88	89	89	90	90	92	94	95	96	98	100	5, 19
88	89	89	90	90	92	94	95	96	98	100	
94	95	96	97	98	99	100	101	102	105	107	5.19
93	94	95	95	96	95	99	99	100	103	105	
122	123	125	128	128	129	130	131	132	133	135	7.18.5
121	122	124	127	127	128	129	130	131	132	134	
81	82	83	84	85	87	88	89	91	93	96	7.18
80	81	82	84	85	86	87	89	90	93	95	
106	107	108	110	111	114	115	115	116	118	121	19.8.15
104	105	106	108	109	110	111	112	113	114	116	
100	100	101	102	103	104	105	106	107	109	110	8.18
92	93	94	96	98	100	100	101	102	103	104	
81	82	83	84	85	86	87	89	90	92	95	8.8.10
78	79	81	82	83	85	87	89	90	91	95	
363	365	370	375	378	380	384	390	397	400	405	8.C.10
358	360	367	371	376	378	382	385	391	398	400	
134	137	138	142	144	146	148	150	152	154	156	13.9
130	133	135	139	140	143	145	147	148	150	151	
162	164	166	168	170	172	174	175	176	177	178	13.9
158	159	160	161	162	163	164	165	165	168	170	
180	182	184	186	188	190	192	194	196	198	200	13.10.9.11
173	175	178	181	183	185	187	189	191	193	195	
169	170	172	175	176	179	180	182	183	185	188	13.10.9 11.10
169	170	172	173	175	178	180	182	182	185	188	
110	136	137	139	141	144	145	146	148	150	154	9.11
109	131	133	136	137	139	140	140	142	145	148	
124	110	113	115	116	118	118	120	120	122	123	9.11
129	110	112	114	115	117	118	120	120	122	123	
204	208	210	214	219	222	222	223	225	231	233	13.8.6.18.15
410	415	420	425	430	435	440	445	448	448	450	13.8.6.15
188	190	192	195	197	199	201	203	205	208	210	8.10.14 18.16.17
183	185	187	190	192	194	196	198	200	203	205	
63	64	64	66	66	67	67	67	68	68	69	12
85	86	88	89	90	91	92	93	93	94	94	12
72	73	74	75	76	76	77	78	78	79	80	12
68	68	69	70	70	71	71	71	72	72	72	
350	355	360	365	370	375	380	385	390	395	400	15.6
260	264	268	272	276	280	284	288	292	296	300	14.6
275	280	285	290	295	300	305	310	315	320	325	3.15
1760	1791	1803	1840	1854	1885	1909	1935	1957	1998	2039	
2637	2663	2701	2741	2769	2803	2831	2863	2891	2930	2969	
1273	1289	1304	1324	1340	1355	1366	1378	1389	1403	1413	
610	619	628	637	646	655	664	673	682	691	700	
6280	6362	6436	6542	6606	6609	6770	6849	6919	7022	7121	
69.5	70	70.5	71	71.5	72	72.5	73	73.5	74	74.5	

...m apparatus to be used in developing these muscles.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE U. S. NAVAL ACADEMY TRAINING.

By LIEUTENANT LOGAN CRESAP, U. S. Navy.

The sentiment in the navy to-day, in regard to the Naval Academy, appears to be a constantly increasing demand for a higher development of the graduate. As the sphere of a naval officer's activities has enlarged, and it has enlarged enormously even in the past ten years, there has been a corresponding increase in the requirements which the service has expected of the newly started young officer.

It will probably be conceded by all, that a graduate of the Academy to-day is required immediately upon his arrival aboard his first ship to assume duties and exercise supervision among harder and more complex conditions than ever before existed in the service. It is also a fact that the graduate to-day is given greater responsibility among these surroundings than ever before.

There has existed, and probably exists to a lesser degree, a shortage of officers which has made this demand all the more insistent, and has resulted in a further reliance upon the young man's ability and adaptability. In other words, both the growth of the navy in size and the expansion of its demands into broader fields of technical activity has created an increased demand upon the product of the Naval Academy. Various examples of this may be quoted, but every officer is thoroughly familiar with the condition.

How is the Naval Academy trying to supply this demand for training and ability? If the demand exists, then the Academy is the place where the *beginning* of the development of the supply is taking place. It is unquestionably true that the course at the Academy is as full as can be stood by the midshipman. It is also true that the course is very complete and gives the graduate a thorough practical foundation upon which to begin his career.

Can the Academy do more? And if it cannot do more is the theory of its system correct? For does it supply the demand?

The course at the Academy is gradually becoming merely a descriptive one in many particulars. Some of the text books are simply a complete descripton of machinery, devices or apparatus to be found in the service. The demand for instant adaptability to the conditions aboard ship has resulted in moulding the course into a system by which the graduate may be immediately familiar with as much of the apparatus of all natures aboard ship as it is possible for him to study. He recognizes this piece of machinery, that appliance, he probably is also familiar enough with its construction to intelligently direct its operation. He, therefore, satisfies the requirements of his superior officers, or the service.

But should he see, perhaps on a new ship, even on an old ship, another device, operating on the same principle, but differing widely in its appearance or methods of adopting that principle—would he be in a position to grasp readily the method of its correct operation? The answer is most certainly *no*.

I have spoken above of his conduct in handling a piece of machinery. That is a small factor of what he is called on to handle. All of his actions aboard ship in the handling of power—power developed by steam, by electricity, by compressed air, by gun powder and other explosives, even by the sea itself—are governed and must be governed by his knowledge of the underlying principles which make its application possible.

Is it not possible therefore that, in our endeavor to make the graduate of use in the service as soon as possible, we have failed to provide him with the necessary foundation upon which to build, not his first five years' of active service, but the succeeding twenty-five?

Constant demand has been made upon the Naval Academy authorities to make the course practical. Boards have been appointed and have conscientiously tried to fill the demand, and have succeeded. But is it not possible that, with four years as the course at the Academy, and with the limit of the average young man's ability of absorption well established, we have crowded out part of the necessary ground work of theory and substituted a little too much of the desired practice?

The Academy is a school where young men are prepared for profession. There are other schools in the country which prepa

g men for professions, though other professions. It may id that the Academy it unique in the demands for which it created. That is only true because it is the only Naval emy we have. It is absolutely similar in principle to all ls that prepare a man for a definite profession. Therefore, e not draw some vital truths from a comparison?

what medical school do we fit young men to become operat- ractitioners upon graduation? In what law school do we re young lawyers to become upon graduation, able to handle cases? Do any of our mechanical or electrical schools fit graduates to be immediately available for regular engineer- work? Do any of our business schools turn out business ' To every question we must answer "No." In fact the e tendency in the development of our colleges seems to to a lengthening of their course. So insistent has the de- l become, that one college (Minnesota) has changed its e to five years, and others are expected to follow. In all professions, we see that the college is thus endeavoring to up its course, so that the graduate will have a firm founda- upon which to build the structure of his after life. The e itself is a great school of preparation where all the laws heories, the application of which will be used in later life, ught. Only enough practical work is added to the course sist in the teaching of the subject, and in every profession nd that a period of further development is necessary. The g medical graduate puts in a year or two as an interne in a tal. The young law graduate occupies a desk in a lawyer's and is called upon to look up information, to draft legal nents as directed. In the mechanical and electrical engineer- rofessions we see this probationary period further enforced. shops, drafting room and testing room are all brought into to bring the young graduate to a proper coordination and cation of the theory his alma mater supplied him. No better ple of this can be cited than the wonderful system that General Electric Company has perfected and is using to-day. e, graduates of the finest technical schools of our country put in a department, at small pay, where their energies are cted to the testing of electric apparatus, the natural field in ch all theory that they imbibed at their college, is applied ctically. And they stay in that department for from eighteen nths to two years. At the expiration of that period the com-

pany draws those it desires to keep, those who can be of use t it in more than a manual way.

Thus in every profession we see a condition existing which entirely opposed to the navy's system—entirely different in bo theory and in result. The contrast may be briefly stated as fo lows: The Naval Academy at present teaches the graduate become immediately available for operative duty, while in pra tically all other professions we find that the school is a school preparation and the graduate is fitted for operative duty o after a complete and exclusively practical course of about t years. And in all the other professions of life it has been fou and proven that it is necessary to use the school as primarily teacher of theory, and to leave the coordination and applicati of this theory to a further period of post-graduate applicatio Does it not appear from this that we may have been mistaken permitting the conditions affecting us to crowd out the enfor ment of a thorough theoretical foundation for the addition o little extra practical knowledge? Is our profession so differ that we do not need such post-graduate study? Or is our sch so excellent that it eliminates the necessity of that study?

I have not mentioned as yet the two years' period that register calls the "probation period." And it is properly nam That two years was unquestionably designed as a period in wh the midshipman should learn the methods and devices by wh their theory was applied in actual practice. In all other prof sions that period of probation is necessary. Its use was inaug rated in the navy years ago. But is it used now? Can the answ be anything else than "No?" It is easy to prove. Are our e aminations upon the completion of our probationary two ye very different from those given us on graduation? The diff ence is so slight as to be negligible. In the writer's case th was no difference.

In other words, the service, or those directing its sentime at the Naval Academy, do not see any difference, or at least ve little, between the requirements of a midshipman upon graduati and upon commissioning. It is not at all surprising then that great deal of agitation has arisen to commission a graduate i mediately, or in other words, to publicly announce that a gradu of the Naval Academy is qualified to be a thorough naval offi upon his graduation. How many graduates of the University Pennsylvania's Medical College are qualified to practice medici

many happy possessors of the degree of E. E. from the Institute of Technology are immediately qualified to be ng engineers?

ld it not be advisable therefore to incorporate a little more a course in "Thermodynamics," a more complete course ectricity," a more thorough course in "Calculus," add perhe study of "Least Squares," and "Precision of Measure-" give more "Strength of Materials" and "Machine De-(and other subjects more or less important) at the Academy eliminate, if necessary, enough practical work to meet the d balance. In doing this the two years after graduation of necessity become in our profession, what I think it was d for, and what it is used for in other professions. It throw on the older officers of the service an additional sibility perhaps, but would they not, in course of time, be fitted to handle it? We might say that at present the is shirking the responsibility of teaching the young officer s gradually pushed it over on the Academy. The foremost f the service, before even "battle efficiency" in import- the training of the young men in the service. That is the tion of the work "conservation" in its highest sense. is most decidedly applicable to the officers especially.

policy would also result in a better system of eliminating n graduation and commissioning. In civil life the process ination begins to be forcibly felt at the expiration of the ars' probation. It is at that time that classes begin to e to the various levels to which their members are destined. our system as at present worked, the eliminating practi-ases upon graduation, to be actively taken up about 25 or s later.

ve placed the whole subject as a question, or series of ns. They may be epitomized in one. Is the present sys-the Naval Academy the best one for achieving the purpose ich the government maintains it? I hardly think it is, and s there are others who agree with me, and still others who agree after giving their attention to the matter. The of the navy are responsible to the people of the country internal administration of the Navy Department and the g of the navy's personnel. If the Academy's system needs tion, the burden of making the correction lies with the tself.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE AMERICAN NAVY AND THE OPINIONS OF ONE OF ITS FOUNDERS, JOHN ADAMS.

1735-1826.

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As the service which grew up to become the navy of the United States could neither create nor provide for itself, it may be worth while to attempt the discovery of the point of view of the statesmen responsible for its foundation. Without their aid, that is without the sanction of a politically organized community, the commerce-destroyers of the Revolutionary War would have fallen under the penalties of piracy. But by adapting the cruisers commissioned by the separate colonies as a Continental Navy, that service secured an international standing and gave the Confederation a place among the maritime powers of the world. This act of organization was in itself a bond of union, and the exploits of the infant navy helped to develop the sentiment of nationality in 1776—though the process had to be repeated for the next generation. From the beginning it was apparent to one man at least that the political significance of the navy as a bond of union was of no less value than its military and economic service. John Adams forced the Continental Congress to adopt the array of minute-men around Boston as a national army and to place them under the command of a general from Virginia for political reasons, but his task was not complete until the same principles had been applied to the maritime forces of the New England colonies. When that was done, four months after the adoption of the army and twice as long before July 4, 1776, his strenuous plea for independence had a sound material basis. The colonies had raised troops and ships to make war on the King, and they could not continue to profess an allegiance which required their disarmament. Of the loyalty of Adams to his

favorite branch of the service there was never question out his long official career, and the opinions he record the reminiscent years which followed his retirement Presidency in 1801 were more consistently favorable progress than those of any statesman of his generation. of the parties which divided the nation in those days s consistency in these matters, and his fidelity to the idea (navy must be credited to his personal character and tra

Loyal as he was to the navy, Adams was careful to reproach of extravagance in providing for its increase. apparent lack of liberality in such matters—he was neve in favor of ships-of-the-line, the modern touchstone f manship, and he allowed the fleet to suffer reduction a the immediate necessity for its employment was over— admit the excuse that he lived in the days of small thi country was not very rich or populous before 1801, and was apt to be bitterly resented. Whoever had to choos keeping the navy on short allowance and provoking th tion of the Union deserves the charity of later and riche tions. Adams counted three rebellions against the fiscal of the general government before he went out of offic felt that it was unsafe to go on increasing the nationa borrowing money at eight per cent. The fact that mc funds so raised went to the support of an army whi garded as useless or worse made him bitter against th and confirmed his belief that the navy was really the m tial and natural defense of his country.

The fact that he had in 1797 an opportunity to r efforts to make the navy effective, taken in connection earlier action in the Continental Congress, gives him title to be counted as a founder of that service. In fa ington is his only rival in the list which assigns credit foundation. The Father of his Country, however, ha tense personal interest in naval affairs, and his recomm and orders are apt to be formal and official in dealing w Adams, on the other hand, had a lifelong acquaintance faring men and their problems and a distinct prefere navy rather than an army which Washington could by share.

Taking note of these claims, it is a matter of surpri the views and services of John Adams in regard to th

of the United States Navy so generally ignored by naval rians. Even in a plate supposed to show portraits of the ders, a recent work presents only his colleagues on the al Committee of the Continental Congress, though not one of would have denied that Adams was the ablest debater, the t indefatigable man of business, and the most eager advocate aval armaments who took part in their work of discussion and inistration. Much may be forgiven to a devoted biographer; the limit was exceeded by the writer who put "Founder of American Navy" on the cover of a work dealing—after an ginative fashion—with the career of one who died abroad ing the decade that that service was non-existent. Another tain whom Adams called a "foreigner of the South" has n described as the "Father" of our navy. History has ac- ted both John Paul Jones and John Barry on a higher plane n Adams—who had had troublesome dealings with both— uld have been disposed to allow; but there was some reason his protest against crediting them with exploits really per- med by New England seamen; and it would be absurd to com- morate them as the founders of a system which required the ts of a statesman capable of securing the support of a mari- e community. The relative merit of veterans of the Revolu- is, however, a trivial question in comparison with an in- tigation of the relation between national principles and the ws which regulated the creation and development of the navy the United States.

This inquiry is easier in the case of John Adams than in that almost any other of our statesmen—except his equally eminent . Both have been described as conscientious and contentious a notable degree; and the many volumes of their published rks bear out that description. We have had administrators, even Presidents, who might be classed as inarticulate, men ose state papers, especially those dealing with such peculiar jects as the building-up of a navy, had to be edited by subor- ates. It was not so with John Adams: after accumulating ormation in regard to the marine and fisheries for half his life- ne, he had to note the strategic significance of our lack of sea- wer during eight years of warfare; and he did not hesitate to press his opinions in greater detail than his predecessor—or an most of the Presidents of later years. Moreover, the views f the elder Adams were, like those of his posterity, largely in-

dependent of partisanship. His naval doctrine was peculiarly his own, and his break with the Federal party—of which he was also one of the founders—was perhaps fortunate for the navy, which might otherwise have been injured by the collapse of that party after the war of 1812. Doubtless the army suffered because Alexander Hamilton, who was virtually its commander during the administration of John Adams, was also the leader of the inflexible wing of the Federal party and the unsparing critic of the President whom that party had chosen. Had the President been as tractable as had been expected, the navy might have been sacrificed to the demands of the military leaders, and both services might have become permanently unpopular. Any delay in material progress was doubtless preferable to this not improbable result of an unbroken alliance with the Federal party.

Adams felt a certain pride in dating his confidence in the fighting power of his countrymen and his longing for independence from 1755. Irritated over the conduct of the ministry toward the New England forces which had taken Louisburg, he became convinced that, "the American colonies, if left to themselves and suffered to unite, might defend themselves against the French much better without Great Britain than with her." With the rising generation of Massachusetts in this temper and with the French out of the way, the colonists were ready to renounce the authority of George III and to undertake their own defense by land and sea.

Such views helped to steady the nerves of those delegates to the Continental Congress of 1775 who foresaw the necessity o fighting for independence. The two Adamses, John and Samue were the natural representatives of a community that had a army in the field before half the provinces had cast off the allegiance to the King. The decision to adopt these troops as Continental Army, with a commander-in-chief from Virgin was the first triumph of these advocates of independence. drafting the declaration which made the people of Massach setts American citizens instead of British subjects, Ada argued that as the colony had an army in the field and as t military had to be subordinate to the civil power in all f governments, it was time to set up an administration which rived no authority from the Crown. He was eager to guide t other colonies and Congress also in the same direction: thus

wrote almost a year before the famous Declaration was voted that Congress ought to have in its hands " the whole legislative, executive, and judicial of the whole Continent. . . . to have raised a naval power,—and opened all your ports wide."

When letters containing such expressions as these—coupled, as they naturally were, with harsh words about Tories and trimmers—fell into the enemy's hands the British authorities published them in order to discredit the advocates of independence; and the influence of John Adams was indeed weakened thereby. In England the publication caused even more alarm than irritation. General Burgoyne anticipated the experience which taught him that Americans made war in earnest by writing that, though Adams was " a profligate character—neither supported by pecuniary nor political interest—his " vigorous and aspiring mind " entitled him to be compared with Catiline and Cromwell; " America, if his counsels continue in force, must be subdued or relinquished. She will not be reconciled." Had Adams read this warning, he would have been consoled for the ostracism which befell him in Philadelphia.

Congress could not, however, escape from the suggestion that it was time to create a naval power. On August 26, 1775, the Assembly of Rhode Island, representing a community of merchants and mariners already noted for their unruly temper, instructed their delegates in Congress to urge that reluctant body to provide for an American fleet to be employed " for the preservation of the lives, liberty and property of the good people of these colonies." The ships should be equipped " at the Continental expense," and sent where they would " most effectually annoy our enemy and contribute to the common defense." Congress was by no means ready for so uncompromising a resolution, and the Rhode Island proposal was dismissed without definite action. Even in October, after Congress had begun to employ ships " at the Continental risk and pay," the advocates of conciliation and economy declined to comply with this demand. Chase of Maryland—whose position as a Federal judge gave him an occasion for discussing naval affairs a generation later—would allow for two swift vessels for getting intelligence, but he thought it " the maddest idea in the world to think of building an American fleet . . . . we should mortgage the whole Continent." Yet before the month was out he had been converted to the larger

view held by Adams. In his second speech Chase declared th "Intelligence we must have; we must have powder and shot; w must support the credit of our money. You must have a na to carry on the war"; and the majority of Congress had pra tically reached the same conclusion.

Adams had too much of the craft attributed to the people fr whom he had sprung to insist upon the direct adoption of a general principle as a preliminary to practical measures. De gates who had stated in debate that a score of British cruis could block up every harbor south of Rhode Island and that eve vessel which sailed on a trading voyage was bound to be ca tured could still hesitate to vote for an American fleet. B none who consented to provide for the army with which Wa ington had begun the siege of Boston after the battle of Bunk Hill, or to arm the forts that were to guard the Hudson Riv could deny the necessity of discarding every scruple in order obtain ammunition and other supplies for these measures of fense.

In this situation Adams found a better opening than the Rho Island resolution had afforded. Congress learned through c tain agents in London of the sailing of "two North Coun brigs of no force from England on the 11th of August last, loa with arms, powder and other stores, for Quebec without a co voy"; and it was promptly urged that they should be int cepted. A committee of three was named on October 5, to p pare plans for doing this; and John Adams as chairman of th committee reported with suspicious promptness, and took a lea ing part in the debate by which objections were overruled a action inaugurated. Washington was directed to apply to th Council of Massachusetts for two armed vessels and to sen them after the said brigs and to make prize of them "for the u of the Continent; also any other transports laden with ammun tion, clothing or other stores for the use of the ministerial arm or navy in America." Besides asking the authorities of Mass chusetts to place two vessels "under the General's command an direction," similar requests were sent to Connecticut and Rhod Island. The most significant resolve was that "the said ship and vessels be on the Continental risk and pay during their bein so employed." For the force thus authorized Adams drew u articles for the government of the American Navy.

The tendency of the original resolution had been obvious enough to provoke opposition. A delegate from South Carolina, crammed with information by merchants of Philadelphia, denounced the project as wild and visionary: "It was an infant taking a wild bull by the horns." There were other objections besides this dread of the British Navy: "it would ruin the character and corrupt the morals of all our seamen. It would make them selfish, piratical, mercenary, bent wholly upon plunder." Adams retorted in his most "glowing and animating" style, and urged "the great advantage of supplying ourselves, and beginning a system of maritime and naval operations." He had known many of the traders and navigators of his own state, and his acquaintance with them had convinced him that, "if they were once let loose upon the ocean they would contribute greatly to the relief of our wants, as well as to the distress of the enemy." Nor was there any lack of provocation for maritime reprisals. Congress was induced to decree the forfeiture of all armed vessels and transports "employed in the present cruel and unjust war against the United Colonies" by an argument drafted by Adams in which it was set forth that George III had not only directed the seizure of American merchantmen, many of which had been "rifled of their cargoes without any form of trial" under the guns of Boston, but he had sent orders to America to "proceed as in case of actual rebellion against any of the seaport towns and places, accessible to the King's ships, in which any troops shall be raised or works erected"; and one town, at least, had been laid waste accordingly. Congress also denounced the restraining act passed by the Parliament of Great Britain as a "piratical or plundering act"; and Adams held that it was "a complete dismemberment of the British Empire. It throws thirteen colonies out of the royal protection, levels all distinctions, and makes us independent in spite of our supplications and entreaties." Not all the colonies were ready for this high doctrine, but the creation of a navy was a virtual act of independence; and the Declaration was bound to follow as soon as Adams and his associates could overrule what he called "the reluctance of the Southern Colonies to republican government."

Long before the historic date of July 4, 1776, a naval code had been adopted and a naval squadron sent to sea. These results were due in large measure to the readiness of men like Adams to

accept "continual employment, not to say drudgery," in prepa ing the national defense. Up to June, 1776, the infant navy quired most of Adams's exertions as an administrator. He th became a member of that Board of War and Ordnance wh was the only executive authority upon which Washington co rely for aid in prosecuting his campaigns. Compared with th labors, the task of preparing "a plan of treaties to be propo to foreign powers," and of revising the text of Jeffers famous declaration were by no means hard. Nor did Ad shrink from the burden of supporting that Declaration in deb His success on the floor of the Continental Congress was due the fact that he uttered with ardent conviction principles wh he had cherished ever since he had attained manhood, but he used more political dexterity in eliminating objections than mi have been expected from a man of imperious temper.

Returning to his services in the Naval Committee, we find t on November 2, 1775, authority was granted to arm four ves to draw $100,000, and to "agree with such officers and seame are proper man and command such vessels"; and that the couragement "to such officers and seamen be one half of ships of war made prize of by them, and one third of all tr port vessels, exclusive of wages." On November 10, a Ma Corps of two battalions was authorized; and it was voted "particular care be taken that no persons be appointed to off or enlisted into the said battalions but such as are good sea or so acquainted with maritime affairs as to be able to serve advantage by sea when so required"—a counsel of perfect which did not long prevail. Before the month was out the co mittee had to deal with a request from General Washington instructions in regard to prizes. Adams and his colleagues sei the opportunity for adding to the prize code certain "Rules the Government of the American Navy and Articles to be sig by the officers and men in that service"; and these became on November 25. Concerning these regulations, Adams wr at the beginning of a new century while some of his associa were still living, "I had at least as great a share in producing the as any man living or dead"; and the foundation of the na may be dated from this enactment.

The rules in regard to prizes followed the usual custo privateers kept whatever they took: cruisers commissioned

Congress or by the authorities of a colony got only half or a hird of the proceeds. Washington's scruples were relieved by clause validating all captures hitherto made and confirming the stribution of shares. Under the new Articles, the Captain was have six shares, besides his pay of $32 per month; the First eutenant got five shares and $20; seamen added one share to allotted wages of $6.67. Pensions were deducted from prize-oney; and extra shares were to be awarded to men who showed table courage in action or were the first to sight or board a ize.

Much of the text of the early "rules and orders" has a miliar ring, though the rhetoric of our Act for the Better Gov-nment of the Navy of the United States is better than that of e original. Many of the phrases in both were borrowed from e Articles of the British Navy as formulated under the Com-owealth. A captain was to show "a good example of honor d virtue," of course; and he was to "heart on and encourage inferior officers and men to fight courageously and not to ave themselves faintly or cry for quarter." In general he t correct offenders "according to the usage of the sea"—a definite and more sanguinary term then than now; but he award only a dozen lashes on his own authority, though might add "a wooden collar, or some other shameful badge distinction." Adams was also instrumental in imposing the itish military code—which he supposed to be derived from the omans, and liked the better for that—upon the ragged regi-ents of the Continental Army. Doubtless the regulations were ckly administered in both services; and Adams wrote to his ife that, though "a disciplinarian has affixed to him the ideas cruelty, severity, tyranny, etc.," yet if serving as an officer, "I ould be the most decisive disciplinarian in the army." This s, however, to be construed by the records which show that hile President he dealt with the sentences of courts-martial ith a scrupulous regard for humanity.

New England thrift may have dictated the regulation that in "all ships furnished with fishing tackle, being in places where fish is to be had, the Captain is to employ some of the company in fishing": the sick had the first claim; but the surplus was to be served out to the messes, "without favor or partiality and gratis." Rations were not to be reduced on account of fishing.

though the Captain might "shorten the allowance of provisio according to the exigencies of the service, paying the men fo the same." The fatal result of paying scanty wages in de preciated currency was to leave officers and seamen depende upon prize-money for their reward; and this assimilation wi the privateers deprived the navy of any advantage in recruiti and relaxed the maintenance of discipline. Thus Washingto temper was strained beyond endurance by the misconduct those sea officers commissioned while he was directing the sie of Boston.

Meanwhile the Naval Committee had been authorized to e ploy vessels "at the risk and pay of the Continent" in Octob it had procured the enactment of a naval code in November; a it was able to send a squadron to sea under Commodore Ho kins in the spring of 1776. The foundation of the navy may dated from either of these events, and it was with reference the last of them that Adams wrote in 1777 that he was one those "who laid the first foundations, the cornerstone, of American Navy . . . . an honor that I make it a rule to boast upon all occasions, and I hope my posterity will have reason boast." Yet in the very letter of 1813 which contained acrid protest against the attempt to credit "foreigners of South" with merit that belonged to New England sailors, seems to transfer some of his own claim to rank first among founders of the navy to Washington. Writing 38 years af the event, Adams relates that the General, having been told Captain Manly that transports might be snapped up in Ma chusetts Bay in 1775, had hesitated to act on his own autho but had transmitted the report to Congress, and had thus brou about the appointment of a Naval Committee and the adoption certain cruisers by the Continent. This account ignores both Rhode Island proposal and the letter from London wh tempted Congress to send vessels to seize the two brigs bou for Quebec, though both papers are mentioned in the Journ of the Continental Congress prior to the resolution of Octo 5, which adopted colonial cruisers as the nucleus of an Americ Navy.

If Adams allowed his memory to mislead him in regard to t commander-in-chief's part in urging Congress to action he d less than justice to Washington's readiness to act on his ow

responsibility. Without assuming that he had authority to found a navy or appealing to Congress to enlarge his powers, the General had begun to commission vessels to take prizes a month before Congress was prepared to vote. On September 2, he commissioned a Captain Broughton in these terms: "You being appointed a Captain in the Army of the United Colonies of North America, are hereby directed to take the command of a detachment of the said army and proceed on board the schooner *Hannah* at Beverly, lately fitted out and equipped with arms, ammunition and provisions at the Continental expense." All vessels entering or leaving Boston "in the service of the ministerial army" were to be seized, and the proceeds, except military and naval stores, were to be shared "according to the rules which take place in private ships of war," pay in the Continental Army being also allowed. But the Captain was by no means to act according to the standards of a naval commander: "You are particularly charged to avoid any engagement with any armed vessel of the enemy, though you may be equal in strength or have some small advantage." Washington explained that his sole purpose was to intercept supplies, and that this purpose might be defeated by "running into unnecessary engagements." His army lacked the resources required for besieging Boston, and he was ready to drive a bargain with privateers; but the foundation of the navy had to be laid on a firmer basis.

The General also had to discuss projects for invading British colonies in Canada and the West Indies, and his views were shaped by the urgent necessities of his troops. The scarcity of ammunition had produced "a situation which requires us to run all risks"; and on August 4, he asked the Governor of Rhode Island to send one of that colony's cruisers to Bermuda to bring off the contents of an unguarded magazine. It was hoped that the islanders would offer no resistance, and their compliance was to be rewarded by a supply of provisions. If no powder could be had the General suggested that, "the vessel might be sent to some other island to purchase." Captain Whipple actually sailed on this venture but arrived too late to find anything in the magazine. The first squadron equipped by Congress attempted to secure powder by raiding the Bahamas in 1776, but this expedition was likewise unprofitable. A week after taking up the proposal to seek powder in the islands Washington had to reject

plans for raiding certain towns in Nova Scotia. He ob; cause it was "a measure of conquest rather than defen because the British had command of the sea, and th ading squadron would snap up any vessel bound to t ward—an apprehension not realized when the experi tried in October. But he held it unnecessary to forn objections at length "when our situation as to an absolutely forbids our sending a single ounce of it o camp." Indeed he had reason to doubt whether the stores which Congress put on board the squadron eq Philadelphia would not have rendered more service ir teries around Boston.

Washington hardly thought it necessary to explain in regard to maritime enterprises until he was inform resolutions passed by Congress on October 5. Then he that he had already sent vessels to sea, under the con "officers of the Continental Army, who are well reco as persons acquainted with the sea." Two of these under Captains Selman and Broughton, were ordered to of St. Lawrence to intercept the brigs whose sailing ha Congress to adopt the vessels equipped in Massachuse two schooners designated for this voyage "had none bu colors"; and they could not wait to be supplied with tree flags which Washington kept flying on his batt recommended for use at sea. Therefore they had to a private signal "the ensign up the main topping-lift"; s first cruise made under the authority of Congress hac British colors in an unseamanlike fashion. The cond two captains was otherwise discreditable. They ca vessels, but took spoil on shore. Washington instantl the Governor of St. Johns whom they brought home as

The six vessels cruising on Continental account betw Ann and Cape Cod were more fortunate—though their was not satisfactory. The ablest of the captains was Jo whose exploits and adventures were hardly surpassed b any other naval commander of the Revolution—thou has done little to commemorate them, and they have es notice of romancers. Having taken a transport laden tary stores, including 2000 muskets and the big mor was called the Congress and mounted to shell Boston, M

le Commodore of the local squadron; but Washington still
nd it hard to inaugurate naval discipline: "The plague,
ble and vexation I have had with the crews of all the armed
els are inexpressible. I do not believe there is on earth a
disorderly set." The Articles enacted by Congress had to
gned in February; and in directing Manly to have this done
General could not refrain from sharp warnings: "As it is
apparent that the ill success which attended the major part
e armed vessels in former cruises was due to the officers
commanded, you will therefore take notice that a fondness
on shore, indolence and inactivity will meet with their just
ts." Hereafter sluggish officers were to be dismissed and
red incapable of serving the public in any grade.
e net result of the labors of the Naval Committee during
winter was the equipment of that squadron of five vessels
h, under the command of Commodore Ezek Hopkins, made
ile attack on the island of New Providence but failed to
fere with the blockade or the lines of maritime communica-
guarded by the British Navy. The incompetent Commodore
to be dismissed by Congress along with several of his cap-
; and the plan of providing the Continental Navy with a
nander-in-chief who was brother to the chairman of the
l Committee had to be abandoned—though Adams undertook
efense.
lams had been proud of the committee's success in getting
leet to sea; and he had enjoyed the sessions of that body and
ne attached to its chairman. Most of the members were
ble and cheerful; "but Governor Hopkins, of Rhode Island,
e seventy years of age, kept us all alive. . . . His experience
judgment were very useful. But when the business of the
ng was over he kept us in conversation till eleven, or some-
twelve o'clock. His custom was to drink nothing all day,
ill eight o'clock in the evening, and then his beverage was
ica spirit and water. . . . I could neither eat nor drink in
days. The other gentlemen were very temperate. He
r drank to excess, but all that he drank was immediately
nly converted into wit, sense, knowledge and good humor,
nspired us with similar qualities . . . . the flow of soul made
s reading our own, and seemed to bring to recollection in all
. all that we had ever read." Naturally the New Englander

found this course of learning and liquor "the pleasantest part of my labors for the four years I spent in Congress." It was an age of erudite conviviality, and "the man was mortal and had been a schoolmaster." It was notable, however, that the high standard of Roman discipline which inspired the articles of war was imperfectly applied to the selection of officers for the new squadron. The chief place was filled by another Hopkins, and several captains were named from the Providence Plantations. John Paul Jones had to serve as a lieutenant under men whose experience was not to be compared with his; and Adams had to lay aside the list of "persons qualified for officers and commanders" which he had begun to compile in July, 1775. He could not venture to nominate seamen from Massachusetts in the proportion to which their numbers and skill would have dictated for fear of offending the representatives of other colonies. His zeal for consolidating the Union was the most respectable of motives that can be called political; but his experience in 17[illegible] as well as that of 1776 demonstrated the hazard of subjecting the choice of military and naval officers to political considerations. That custom has been long-lived, but the navy has escaped the harm done by its application because of the inevitable respect shown for technical skill in a difficult trade. Had the Naval Committee of 1776 been free to organize victory by a strict adherence to service considerations, the American Navy would owe a higher meed of gratitude to its founders. But after all it is easy to make allowance for their blunders—and to cherish a mild curiosity in regard to the brand of rum that inspired those convivial sessions which for once disarmed the critical temper of John Adams.

Of course the Naval Committee had to deal with many strange inventions. Learned gentlemen applied their classical reading to the solution of nautical problems, and there was no lack of designs for galleys and barriers for the defense of harbors—to say nothing of plans for burning or blowing up the British Navy. Dr. Franklin designed galleys for the Pennsylvania Committee of Safety; and Adams was afloat with a squadron of these a month before he had induced Congress to adopt a naval programme. He was ready to believe that these craft, rowing twelve oars on a side, could make four knots an hour against a four-knot tide; but it was soon proved that they were "to

e to be handy, and too small to live and work in a sea"; and design for 1776 was to be 100 feet long and to carry heavy both forward and aft, besides many swivels and three-ders. It was hoped that they might "put to sea, live and in a storm"; and Adams was convinced that they might off any ship by the fire of their 42-pounders, and that a a of them would prove "the best engine in the world for ing and protecting fire-ships and rafts." History does not in these opinions, but they deserve to be remembered in con-n with the unsparing ridicule lavished upon Jefferson's of gunboats by the Federalists and their posterity.

m Boston Bay Colonel Josiah Quincy forwarded a plan lockading the British squadron in order to capture the gar-and the ships; but even Adams found his proposal "too and startling"; and Washington disposed of it by declar-at his troops were, "in a manner, destitute of cannon, and elled to keep the little powder we have for the use of mus-." Yet the gallant old colonel lived to see the British can-led by a few "field-pieces from the east end of Thompson's l," and baffled the next day by a line of whaleboats hed across the bay. Had there been fire-ships ready for e in March, 1776, with galleys to hide them in cannon e, Quincy thought "a most glorious conflagration" might overtaken the ships which lingered in Nantasket Road after vacuation of Boston. He was ready to approve the inci-l destruction of life—though it might have reached his son, was Adams's intimate friend and the King's Solicitor-Gen--in the hope that it would "put a period to the present

iladelphia had other contrivers of destruction; and Captain Macpherson came from his "handsome country seat" in er, 1775, to endow Adams, or any receptive member of ress, with a deadly secret, "upon condition that it be not ged during his life at all, nor after his death, but for the e of his country." He was "reputed to be well skilled in affairs" because he had been a privateer in the Seven ' War: "He has been nine times wounded in battle; an old ommander; made a fortune by privateering; lost an arm; shot through the leg, &c." Adams found him sanguine, espe-after dinner, "that he can take or burn every man-of-war

in America." After spending the same evening at the City Tavern with a colleague who declared "the row galleys and *vaisseaux de frise* inadequate to the expense," Adams must have been ready to welcome any plausible suggestion for defending the Delaware. The floating defenses proved their value by diverting the British attack on Philadelphia to the land route from the head of the Chesapeake, though they had to give way at last. Meanwhile, Captain Macpherson had seen fit to carry his proposal to Cambridge for the benefit of the Commander-in-Chief. Washington had learned to listen with diplomatic patience; but when he had disposed of the inventor by persuading him to return to Congress with his proposal the General could not refrain from writing that the relief made him happy—a term which rarely came from his pen at that period.

In March, 1776, Congress voted to sanction privateering; and except for the occasional service rendered by defensive flotillas, most of the naval operations on the American coast were of the commerce-destroying type to the end of the war. It is not always easy to tell whether the captain credited with any particular exploit was in the Continental Navy or Army, in the service of one of the colonies, or in the larger group which cruised under letters of marque and reprisal. It made no difference to Americans taken at sea, since the British custom was to commit all crews, even those of merchantmen, for high treason, though they had to be admitted to exchange shortly afterward. Writers who should know better also confuse the record by referring to John Paul Jones and his colleagues as privateers, though they were named to their commands by a vote of the Continental Congress, and as it proved in the case of Landais, were as nearly irremovable as any officer who has ever held a commission in the American Navy.

Commerce-destroying was incapable of deciding the conflict, but it afforded temporary relief from some of the privations which befel the Americans. Until France and other powers took the side of the colonists trade was almost extinguished, except for the goods landed by privateers, of whom Adams reported that they "act with great spirit and are blessed with remarkable success." As he told his wife, "Thousands of schemes for privateering are afloat in American imaginations. Some are for taking the Hull ships with woolens for Amsterdam and Rotter-

dam; some for the Irish linen ships; some for outward-bound and others for inward-bound Indiamen; some for the Hudson's Bay ship; and many for West India sugar ships. Out of these speculations, many fruitless and some profitable projects will grow." For proposals for cruising in European waters, John Paul Jones may have been chiefly responsible, though Adams had not heard of his scheme of cutting off the coal supply of Ireland by a descent on Whitehaven, the adventurer's native place. The statistics of predatory operations can never be made complete, but the Adams correspondence has various illustrations of their effect on domestic economy, or of their failure to relieve the privations of the colonists. In August, 1776, Mrs. Adams had to report that, in spite of the "fine haul of prizes" brought into Boston harbor, all English goods and West India produce were very dear. A year later, after the capture of many cargoes of rum and sugar, Adams gave the Philadelphia price of brown sugar "of the meanest sort" as a dollar a pound, while loaf sugar was worth four dollars: "Everybody here is leaving off loaf sugar, and most are laying aside brown. As for wine and rum, give me cider, and I will compound." Later, after noting that punch had gone up to 20 shillings a bowl—a vague statement to a race not familiar with the standards of his convivial century—he added, "Whiskey is used here instead of rum, and I don't see but it is just as good." Doubtless it answered the purpose better than cider; but the punch clubs of the thirteen colonies must have regretted the Jamaican spirit, especially when lemons were not in stock. Behind all this, we can imagine a vast amount of privation patiently endured by the patriots, and not a little discontent among the merchants and capitalists.

From the administrative problems of the Continental Congress and the Board of War, Adams was relieved before the end of 1777 by an appointment as one of the commissioners to the court of Louis XVI. He had been an early advocate of the French alliance, though he had hoped that it might be made on terms that would keep the United Colonies separated, "as far as possible and as long as possible, from all European politics and wars." Others had been willing to offer American territory to France as the price of her support, but Adams wished to give her no more than "a practical monopoly of trade in America." As it turned out, France had to be satisfied with less than this, in

spite of the treaty of perpetual alliance which the envoys had negotiated. When France became a belligerent many of the complications which had overwhelmed Franklin and his colleagues prior to 1778 were obviated. As long as Louis XVI professed neutrality American privateers could hardly be allowed to recruit in her harbors or to dispose of prizes taken on her coast. Yet the adventurers would not be restrained. A Captain Conyngham bought a cutter in Dunkirk and sallied forth to take the Dover packet in the Strait, an act for which the French ministers had to make restitution and the American envoys to frame an apology. The treaty made it lawful to open the ports to men-of-war and privateers; and John Paul Jones enlisted many French volunteers to work the guns obtained abroad.

The new envoy crossed the Atlantic in the original *Boston* of the navy, and he found a distressing lack of harmony among his colleagues and much disorder in the papers of the legation in Paris. Adams set himself to work to effect a reform, and the advent of the *Ranger* with her prize the *Drake*, a vessel of the British Navy captured off the Irish coast, gave him occasion to draft a letter calling John Paul Jones to account. Franklin was induced to sign the letter which Adams drew up, by which Jones was congratulated for his victory but regret was expressed that he had not reported "the particulars of your cruise and the prizes you have made." As for honoring his draft for money to reward his crew, he was told that the envoys had "no authority to make presents of the public money to officers and men, however gallant or deserving"; and Jones was summoned to explain his assumption that the full value of his prize belonged to the captors. The act of Congress allowed their claim to only a half and it was evident that the gallant Captain was not scrupulous in business affairs.

Adams did not meet John Paul Jones until May, 1779, when the envoy was preparing to sail for home. The Captain gave a banquet at *L'Épée Royale* at Nantes, and Adams found the dinner elegant and the company gay: "no very instructive conversation, but we practiced the old American custom of drinking to each other, which I confess is always agreeable to me." On boarding the *Ranger*, Adams noted that the marines paraded in British regimentals, and that Jones and his officers also wore a costume "variant from the uniforms established by Congress

Doubtless Adams saw, or fancied, more than this when he described his host as "the most ambitious and intriguing officer in the American Navy. Jones has art and secrecy and aspires very high. . . . Eccentricities and irregularities are to be expected from him. They are in his character. They are visible in his eyes. His voice is soft and small; his eye has keenness and wildness and softness in it." For these graphic notes we can afford to forgive the writer for whatever there was of injustice in his estimate of the hero.

Whether Adams was right in regard to Jones or not, he was quite capable of interpreting the character of Captain Landais of the *Alliance*. That officer had a grievance against those who had denied him advancement in the French Navy, and Adams found, after living in the cabin of the *Alliance* for several weeks, that he was of no better temper in his American command, being "jealous of all his officers, of all his passengers—an absent bewildered man," one sure to be ruined by indecision. The conduct of Landais in the famous combat with the *Serapis* justified this verdict, but Franklin and John Paul Jones failed in their effort to remove him from his command. The French Minister of Marine had protested that many French volunteers in the *Bonhomme Richard* had been killed by the fire of the *Alliance;* Franklin had ordered Landais to turn the ship over to Jones; and Jones had actually gone on board. But the officers and men were persuaded that, as Congress had named Landais to command the *Alliance*, they could accept no other captain; and Landais sailed for the United Colonies in full possession of his rank—though he had to be removed as insane before the voyage was completed.

Adams returned to America in a French frigate, and after a short visit to his family he sailed in the same ship for another diplomatic mission in Europe. Thus his diplomatic service withdrew him from the work of administration and legislation by which the navy might have been established on a permanent basis. As it was, the navy of the Revolution never attained a sound military organization, and it was practically dissolved as soon as independence was secured. It is doubtful whether Adams would have agreed with the verdict rendered in 1798 by Stephen Higginson, a member of the Continental Congress and a leading Federalist of Boston, who wrote, "We have not only a

navy to raise and officers to form, but we have to roo
counteract the ill habits contracted in our navy last v
no proper characters were in the service, and no exar
will serve as a model for a young man to follow." Bı
as President, followed his predecessor in nominating v
the Revolution to commands in the new navy, and he v
admiration of the exploits of John Manly and other
land seamen at a later date. Whether he would have
Manly to the command of one of the frigates equippe
reprisals on the French or not is not a practical questior
the standard works on American biography asserts th
nomination was made; the other has it that Manly
chosen because of blots on his brilliant record. Yet t
that he, like his rival John Paul Jones, died in 1792—
before Washington had authority to appoint a single

Adams made a brave fight for the rights of New
fishermen when a treaty was made with Great Britai
with his contemporaries that the fisheries were a nu
seamen and thus a source of naval strength as well as
Had he been in America when the Constitution was a
1787, he would have endorsed the clause that sanct
creation of a navy, though he could not have anticipat
would be left to him as President to make it effective
later. The principal defender of the navy in *The Fe*
not in the Convention, was another future President w
feel the need of naval defenses at the end of 25 years.
showed that without such defense the commercial met
the Union might become "a hostage for ignominious c
with the dictates of a foreign enemy, or even with the
demands of pirates and barbarians." Many dangers w
should Europe become involved in war "and all the u
sions attending it be let loose upon the ocean." Mor
Articles of Confederation contain "no provision for tl
offenses against the law of nations; and consequently
the power of any indiscreet member to involve the Cc
with foreign nations." A navy capable of restraining
states and protecting commerce "against the predator
licentious adventurers" was indispensable to the gener
ment. Every point in this warning was to be verif
Madison's personal experience, whether he had taken h

significance of his own argument or not. In one particular, however, Adams was less clear-sighted than the most pacific of his Virginian contemporaries. Jefferson was full of plans for repressing the Barbary corsairs while representing the Confederacy at Paris in 1786, but he got little encouragement from his colleague in London. Since the failure of his plan of forming a European league to refuse tribute to the pirates and to punish their depredations Jefferson had become frankly belligerent, and had begun to draft naval programmes for carrying out his proposal. He also argued that a navy would procure us respect in Europe and also "arm the federal head with the safest of all instruments of coercion over its delinquent members." Adams declined to credit Congress with resolution or liberality enough to make this practicable: "I agree in the opinion of the wisdom and necessity of a navy for other uses, but am apprehensive it will make matters worse with the Algerines." On the whole, he reckoned that it would be cheaper to pay the corsairs a million dollars than to leave commerce exposed to their depredations, and that it would be "still worse to add two or three millions more in fitting out a navy to fight them in order to save that sum in customary presents." Both statesmen regretted the commercial zeal of their countrymen, but Jefferson took the larger view: "We ought to begin a naval power if we mean to carry on our commerce. Can we begin it on a more honorable occasion or with a weaker foe? . . . . Paul Jones with half a dozen frigates would totally destroy their commerce; not by attempting bombardments, but by constant cruising and cutting them to pieces"; and an estimate of a cost of a squadron of 150 guns was annexed to this proposal. But Adams was right in assuming that the Congress of the Confederacy would hesitate over naval appropriations.

It was not until Washington had begun his second term as President that money was voted for the construction of four frigates for the specific purpose of protecting our trade from "the depredations of the Algerine corsairs"; and the act of 1794 provided that this naval programme should be suspended if a treaty were made with the Barbary powers. Jefferson was then Secretary of State; and Adams, who as Vice-President had little to do with debates in the Cabinet, wrote in 1822 to ask Jefferson whether this "second commencement of a navy for the United

States" was not brought about by his urgency, whether, in sh
it was not "Jefferson's navy" that was then founded. Thou
reminded that Washington was not interested in naval aff
and that Hamilton, the most influential member of his Cabi
cared only for building up the army, Jefferson declined to co
mit himself to the view put forth by his correspondent—or
trust his memory for any account of the debates of 1794. If
had ever been a champion of the navy, he had lapsed from
faith before he retired from office; and he may not have ca
to be reminded of his inconsistency. Yet his dealings with
corsairs were both vigorous and resolute: on becoming Pr
dent in 1801 he found Tripoli disposed to make intolerable
mands and threaten hostilities: "The style of the demand
mitted of but one answer. I sent a small squadron of frig
to the Mediterranean .... with orders to protect our comm
from the threatened attack." Neither Cromwell nor Chat
could have spoken more bravely, and Congress proved ready
support the President by declaring war.

Such action was better than the bargaining which had ch
acterized the previous administrations. Three of the frig
were completed in spite of the treaty concluded by Washingt
and in 1796 Hamilton, then out of office but acting as c
fidential adviser to the Cabinet, urged that they should be
ready for a cruise, making the Barbary corsairs "the sole ost
sible object," but allowing the main purpose, that of driv
off the French privateers, to "circulate in whispers."
Algerines had to be pacified by other means, and in 1797 Ad
asked Congress to provide the Dey with two vessels b
"according to the choice and taste of Captain O'Brien," who
been a captive and was selected to serve as consul at Alg
The Dey had "advanced the price of our peace with Tripoli
become pledged for that of Tunis," and he was rewarded in 1
by the delivery of the frigate *Crescent*, built at Portsmouth, N
Hampshire, of "live oak and cedar, coppered, with guns and
other equipments complete." Her cargo included four and a
tons of silver, about $100,000, for distribution among the pir
cal states of Barbary. Adams had written in 1794 that, "if
do not purchase a peace with the Algerines, we shall all dese
to become their captives": and he acted accordingly when he
came President, though Congress had dealt more liberally v
the navy than he had anticipated.

The three frigates for which money was voted when the naval appropriation was reduced on account of the treaty with Algiers, were intended by Washington to be superior to any vessels of their class. In fact it was promised that they should be able to fight a ship of 64 guns—the *Constitution* was designed for 44 only—and to run from the heavier ships of the line. Adams was in office when these frigates were launched in 1797, and he had to assume the responsibility of equipping them for service against the predatory cruisers employed by the French Directory. He also had to rescue the infant navy from the clutches of an incompetent Secretary of War and to organize the Navy Department with Benjamin Stoddert as Secretary in 1798. In doing this he can hardly be said to have had the support of public opinion, or even that of the Federalist party of which he was the nominal head. The followers of Jefferson were not willing to go to war with France; those who took their opinions from Hamilton were eager for war; but they proposed to carry it on in conjunction with England, with the Spanish colonies as the principal object of attack and the British Navy as the instrument for securing command of the sea. Thus a Democratic partisan was condemned by a Federal judge for denouncing the President's political mistakes, among which his militant policy and the creation of a "permanent navy" were specified. Judge Chase had no hesitation in sending the writer to prison, but he virtually apologized for the President's speeches in favor of the navy by saying that they were merely the echoes of addresses made by mercantile bodies, the Marine Society of Boston and the like. As Chase and Adams had argued on different sides when the foundation of the navy was in question in 1775, this plea may be called disingenuous. Adams had been the consistent friend of the navy ever since, and his policy in 1797 was not based upon eagerness for war or for any of those filibustering plans advocated by Hamilton, for "squinting at South America" or even for conquering everything east of the Mississippi. He had, moreover, a wholesome horror of the national debt and oppressive taxation which might result from an adventurous foreign policy.

As President, however, he was ready to protect commerce from the French privateers, many of them vessels built in America and owned or even commanded by our citizens. Having summoned Congress to consider "effectual measures of defense"

in May, 1797, Adams stated his own view with his usual vigor: "A naval power, next to the militia, is the natural defense of the United States. The experience of the last war would be sufficient to show that a naval force would have . . . . baffled many formidable transportations of troops from one state to another . . . Our seacoasts, from their great extent, are more easily annoyed and more easily defended by a naval force than any other." The Senate's answer, which though signed by Jefferson as Vice President, was voted by a majority of Hamilton's adherents promised to consider the President's suggestions, "whether they relate to external defense by permitting our citizens to arm for the purpose of repelling aggressions on their commercial rights and by providing sea-convoys, or to internal defense by increasing the establishment of artillery and cavalry, by forming a provisional army, by revising the militia laws, and fortifying our ports." This ignored the elementary strategic views advanced by Adams, and substituted questionable devices, such as the arming of merchantmen and reliance on the British Navy for convoy for the naval programme for defending the coast. Adams felt that he had been thwarted by his own party when the establishment of a provisional army was substituted for the naval programme he had recommended. The regiments could not be recruited up to their full strength, but their maintenance was costly; and the President at last told his Secretary of War that as there was no more chance of a French Army appearing in the United States than in Heaven, the force, of which Hamilton had been made commander-in-chief, had to be reduced to save expense.

Meanwhile, the three frigates had been commisioned to make reprisals on the French; and the President was able to report substantial achievements to Congress before the end of 1798. "Perhaps no country ever experienced more sudden and remarkable advantages than we have derived from arming for our maritime protection and defense. We ought without loss of time to lay the foundation for an increase of our navy to a size sufficient to guard our coast and protect our trade." Strategic argument was encumbered by a proposal to collect timber for frigates, and for six not impossible seventy-fours, to be constructed in the future. Jefferson continued to accumulate timber; and those of us whose recollections go back to 1881 may be re-

ıinded that the stock then existing was brought forward as an bstacle to the use of steel in building a new fleet. Adams had lso to choose sites for navy yards, and he must have yielded to ocal demands in distributing these establishments along the Atlantic coast.

The President had more than his share in the details of administration in all departments. The most pressing cares were those elating to the nomination of officers for the new military establishment. In the army Adams tried to preserve the relative rank f the veterans of the Revolution, but in this he was overruled by Washington, since the Commander-in-Chief had been induced to romise Hamilton the second position in the service. Neither Washington nor Adams professed to disregard political considrations in making appointments in the army, and both made me nominations for personal and domestic motives. The navy as more fortunate. Its captains were all bred to the sea and ained to fight in the previous war. Of the six captains named y Washington for the vessels authorized in 1794, two had been manders and two lieutenants in the Continental Navy. Truxn represented the privateers; and Talbot had fought in many l engagements while holding a commission in the Army. e captains were assigned to superintend the construction of e ships which they were to command; Dale got leave to sail for ina; Barney preferred a command in the French Navy to that ered him by Washington; and Talbot was placed in reserve without pay—which Adams regarded as a formality not affecting his relative rank, though Truxtun laid claim to seniority on that ground. The President had much trouble over this question of precedence, but Truxtun's brilliant action with *L'Insurgente* seemed to give him the final advantage. He was, owever, dropped from the service when Jefferson had to reduce he number of captains—and he wrote to Hamilton in the charcter of a persecuted Federalist. Captains had much to say in regard to the appointment of lieutenants and midshipmen; and Adams protested that he was ready to dismiss any of these for the good of the service. Yet he deferred to his political associates and rivals in selecting junior officers, even consenting to have a nephew of Hamilton's, a foreigner not yet naturalized, made a lieutenant, though some of Hamilton's American kindred were found unacceptable. But the navy escaped the entangle-

ments under which the Provisional Army, "that damned Army," as Adams named it in later years, remembering how much it had cost and how unfit for service it was in 1800. The naval establishment, scanty as it was in material and numerical strength, was permanently organized; and many of its noblest traditions can be traced to its new foundation under the Presidency of John Adams.

Details of discipline were regulated by higher authority than would now be required; and we find the President and his Secretary discussing matters which might have been left to the discretion of captains and commodores. Like Washington, Adams was alarmed at the tendency of naval officers to go ashore. He thought that a frigate allowed to winter in a French harbor would be absolutely worthless thereafter, and his apprehensions concerning the effect of banquets in the West Indies were far from cheerful. On the whole he was disappointed at the results of the West Indian cruises made by our frigates and sloops during the quarrel with France, and he had not considered the despatch of a squadron to European waters. He could not defend commanders from the criticism of his Secretary of the Navy, who found Commodore John Barry an unsatisfactory protector of commerce, but he dealt mercifully with those junior officers who were tried by court-martial. The official programme for the increase of the navy called for six ships of the line, 12 frigates and 24 sloops; but Adams wrote in 1808 that "seventy-fours never had my approbation. My judgment was ever in favor of frigates, and of those but a moderate number." He complained also that, though he had taken great pains to create an efficient navy, "no part of my administration was so unpopular," even in Boston and throughout New England. For 60 years he had held that a navy was "the most natural, safe, efficient and economical bulwark for this country"; but he lived to see a second war with England carried on with a fleet too small to be strategically effective—though it did, as even Jefferson recognized, render the nation "a great moral service."

Adams had a variety of explanations for the failure of New England to promote a vigorous naval policy. He told Jefferson on the eve of the war of 1812 that the construction of a few frigates would have secured the loyalty of that section, forgetting, perhaps, what he had written in 1794, when it had been pro-

posed to prepare for a naval war with Great Britain": If New England people suffer themselves to be artfully drawn into a war they will be dupes indeed; for all the men and most of the money must be forced from them . . . . we have not the smallest thing to hope, unles it be by privateering, and such is now the tremendous naval superiority against us that we shall lose more than we gain by that." The conditions had grown little better when Madison drifted into the next war, but Adams astonished his former allies of the Federal party by defending the general course of the administration and denouncing the conduct of the English ministry.

At a period when parties were divided on the lines of preference for either England or France, Adams was more distinctively American than most of his associates. He also had a stronger inclination toward peace and a natural aversion for a policy of adventure in either hemisphere. Thus he was never tempted by Hamilton's project of revolutionizing Spanish America under the guidance of Don Francisco Miranda, and in conjunction with the ministry of Pitt. The maritime contest with France was to be turned into an open war, and then the Spanish colonies—Spain being regarded as a mere dependent of France—were to be attacked. Miranda was the most plausible of filibusters; he had been a major-general in the army of the French Revolution; and he had secured the confidence of both Pitt and Hamilton—to say nothing of our Minister to England and certain members of the Cabinet of President Adams who always followed Hamilton's leading. Prosposals for rewarding the allies by portions of the dominions of Spain—Florida and Louisiana as far west as the Mississippi were offered to the United States—were balanced by plans for a South American Empire, holding Mexico and Cuba for strategic purposes. The military programme was even more startling in its nature: it was assumed that 10 ships of the line would be required to convoy the 7000 troops required to carry out the plan of the revolutionary *junta;* the fleet was to be British; the troops American; and Hamilton wrote that he expected to command this contingent—if the President could be induced to sanction the expedition. Upon that rock the project was wrecked. Adams did not know how far Hamilton was committed, but he could picture his army at sea; "7000 men and 2000 horses, crowded into transports in the Gulf Stream, bound to

South America, two-thirds of them, within a fortnight after their landing, dead with the rot, the jail fever or the plague, and their fathers and mothers, wives and children, ... cursing John Adams as a traitor to his country and a bribed slave to Great Britain." Pitt, he thought, meant to "dupe me into a rash declaration of war against France, and a submissive alliance, offensive and defensive, with him." Had he been fully aware of the complicity of the officer who was seeking to be made "General over the President," Adams would have been eager to vindicate the "essential powers" of his office. As it was he hastened the conclusion of a treaty with France, and thus embroiled himself with Hamilton and his allies.

None of the Americans interested in this project for international filibustering appear to have realized that the ally which agreed to send troops abroad without arming to secure command of the sea would thus commit her safety and her honor to the mercy of a rival maritime power. Adams found plenty of reasons for rejecting the scheme without discussion; and the plotters could not venture to appeal to the public. Hamilton did his best, however, and Miranda presented his plan to the President in writing, but Adams was not tempted by his plausible style; and the intrigues of his American backers met with no success. But the indefatigable plotter returned to the United States in time to cause much embarrassment to President Jefferson and his Secretary of State. Madison found it hard to meet the protests of the Spanish minister after Miranda had sailed with an expedition to invade Venezuela. Adams was also entangled at last by the fact that his grandson, a college student and son to Colonel Smith, Surveyor of the Port of New York, was one of the recruits whom Miranda led to a Spanish prison; but the Ex-President saved his self respect by assuming a high Roman attitude; and Spain proved lenient for once.

When Jefferson relieved Adams in 1801—the relief was performed without ceremony—he had the advantage of peace with France to enable him to bargain with Napoleon for the Louisiana purchase. To win this vast territory and the navigation of the Mississippi, Jefferson was prepared to waive scruples and even to take a leaf out of Hamilton's book by threatening to join the maritime power of America with that of England in order to secure a command of the sea which should render it impossible

for France to hold a colonial empire. At the same time, the President was engaged in reducing the list of officers of the navy in accordance with an act passed by a Federalist Congress. He performed this task with discretion, retaining more captains than Congress had voted; and he was soon urging an increase in the higher ranks to reward the men who had won distinction in the contest with Tripoli. But his notion that the efficiency of the navy could be maintained by keeping most of the frigates under shelter at the Washington Navy Yard and policing the coast with gunboats was so unwarranted by technical considerations that it deserved most of the ridicule lavished upon it by the Federalists —among whom John Adams was not the mildest critic. By the time Jefferson had reached the retrospective stage in 1815 he had become so far alienated from the navy which he had helped to create as to deplore the fondness of a part of his countrymen for frigates and seventy-fours, and to express his own confidence in privateers as the best instruments for coercing the maritime rivals of the United States.

Adams never inclined to such delusions; and the navy was one of the favorite topics in his writing and reading during his years of retirement. He was always ready to express his preference for the sea service when the army was under discussion; and he drew various lessons on this doctrine from the history of Great Britain and the Netherlands. Of any foresight in regard to the transformation of naval material by mechanical progress he was altogether innocent. Thus he admired Earl St. Vincent for rejecting Fulton's torpedoes without a trial—and for saying that Pitt was "a damned fool" for favoring the inventor. Such anecdotes, Adams thought, made the life of the austere First Lord of the Admiralty better worth writing than that of Nelson—whom he named "Napoleon-Petrarch-Werther" in a too literary comparison.

No man who ever held high office in the United States was less successful in founding a political school than John Adams; but in 1812 he read the report of a speech in Congress by Josiah Quincy which almost made him believe that he had a disciple in his cherished doctrine of naval defense. Speaking on the eve of the war with Great Britain, Quincy urged that, "the first and most important object of the nation ought to be such a naval force as shall give such a degree of rational security as the

nature of the subject admits to our cities, and seaboard, and coasting trades; that the system of maritime protection ought to rest upon this basis; and that it should not go farther until these objects are secured." These moderate demands served to introduce a more inspiring idea: "To exhibit a definitive intent to maintain maritime interests by maritime means, what is it but to develop new stamina of national character?" Adams made haste to congratulate his neighbor for appealing to the representatives of the nation with "the most important speech uttered in that House since 1789," but expressed his amazement that no one member from New England or the Middle States had risen to second or support this plea for the navy. Quincy replied that he had been induced to make this speech by members from South Carolina and that he understood the attitude of his Federalist colleagues: "For the predominating feeling in the mercantile class was at this moment hostile to every form of warlike preparation, which they persuaded themselves would be applied, not to their defense, but to provoke further hostilities with Great Britain, and in support of the views of the French Emperor." Unfortunately, Quincy could not be detached permanently from the narrow views of his party, even by the eager approval of the Ex-President and the example of his equally patriotic son, John Quincy Adams. As long as he sat in Congress Quincy saw fit to obstruct the conduct of the war by denouncing the enlistment of minors and the plans for the conquest of Canada: "Never was there an invasion of any country worse than this in point of moral principle since the invasion of the West Indies by the buccaneers." He also induced the General Court of Massachusetts to add to a refusal to congratulate Lawrence for capturing the *Hornet* that, "it is not becoming a moral and religious people to express any approbation of military and naval exploits not immediately connected with the defense of our sea-coast and soil."

From such anti-national vagaries, John Adams and his son were saved by their escape from the prison-house of narrow-minded Federalism. The elder man continued to hold vigorous debate with friend and enemy up to the end of his life. He renewed a friendly correspondence with Jefferson in old age, and remembered his fellow patriot on the day that both of them died; July 4, 1826, just 50 years after they had carried the immortal

aration. Adams had been eager to establish a Military lemy, at which it was proposed to educate midshipmen as as cadets, during his administration, and he had even con- :d that Benjamin Thompson, Count Rumford, should be in- l to return to his native land to take charge of such an in- tion. It required a certain breadth of view to let the fac' the errant Count was one of the ablest men of science in pe overcome his reputation as a particularly obnoxious '. One of the last occasions upon which the orator of the inental Congress delivered an address was in 1821 when the ilion of West Point Cadets paraded on his home grounds listened to the fervent words of a man of 86 who had helped und the nation which they were called upon to serve. That vas also one of the founders of the navy of the United :s will hardly be questioned by any student of the early his- of the nation. It would, indeed, be hard to name another se talents, both in argument and administration, were applied e support of the navy at such critical periods or during so a span as those of John Adams.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

"VESTES SUSPENDE IN RAMUM CARYAE, SED NE AD AQUAM ADEAS."

By LIEUTENANT FRANCK TAYLOR EVANS, U. S. Navy.

This was said a long time ago, and one who takes the trouble to translate it, will find it is an old nursery rhyme; its application to our modern training system was suggested by one of our old shell-backs. It was not put into Latin (?) by the author, and so, gives a fair measure of the originality which follows.

It was suggested one day during an examination of candidates for warrant rank, when, in looking over the papers of one of the candidates, well recommended for *boatswain,* the following statement was read: "Heavy Manila hawsers should be well oiled and stowed in the store-room." They say that straws show which way the wind blows—that examination was a whole load of hay.

When that reply, about caring for Manila hawsers, was read, a member of the board suggested that the title of this article be placed at the entrance to our training stations.

Where, with all our sailing ships out of commission, are our officers and men to learn that handiness which in time of stress will be absolutely necessary to our naval existence? This question and similar ones kept recurring, until it seemed necessary to put the question to the service at large, to see if an answer can be given.

Let us consider.

Under present conditions, in a very few years, we will be trying to run one of the largest navies in the world, and our only sailors, commissioned or enlisted, will be on the retired list. Can and must such a condition prevail?

We speak of our training stations when we have not one. We have three receiving and fitting-out stations for recruits, but to

say that the output is "trained" is the veriest nonsense; and what is more, we all know it.

Almost anyone is likely to hark back to one's own experience, and this is what one officer had to say, "After more than 11 years continuous duty afloat, I was detached from my ship and detailed for duty at the training station in Newport, R. I. While at sea, I had formed a very poor opinion of the training system, and was decided that it was all nonsense, should be abolished, that nothing was taught the apprentice seamen," and all the rest that goes to make up the usual line of complaints heard in the fleet against these "trained" men.

"Upon taking up my duties at the training station, I was astonished to see what the men were taught, how much they knew and how quickly they learned. It was a revelation to me, and I daresay would be to 90 per cent of the officers in the navy, to see the bag inspections the apprentice seamen put up; to go into the dormitories and see hundreds of hammocks properly lashed; to see two thousand men in absolutely regulation uniform; and, to see the wonderful physical and infantry drills—for they are wonderful and worthy of great commendation. But seamanship is almost unknown. To be sure, there are a few periods in the rigging loft; they can recite the compass and the lead line; but the majority cannot throw a hitch or pass a bend; during their 'training,' they have 20 periods of boat drill under oars afloat, and a few under sail in a 'dumb' cutter in the barrack's yard." *Sed ne ad aquam adeas!*

Yet these are "trained" men and the product of the training stations! Why not be perfectly frank in this matter and say recruits from the "receiving" stations? It is not the intention, in any way, to criticise our training stations unfavorably, or to ridicule them, for the results, in the time allowed, are stupendous, nothing less. However, so far, we have not begun to make a sailor petty officer.

Many criticisms are made of the "training stations," most of which are directed at three or four points. If the critics could know the conditions existing, they would realize that the system, so far as it goes, cannot, to any great extent, be improved.

The primary point sought in recruit training, is to instil into the *freeborn* American youth, with his public school ideas of equality, the understanding that, in a military or naval service, no

two persons are equal, and that immediate, cheerful, and willing obedience must be given to all orders. The quickest way to do this, is to drill the youth as a soldier, and to exact from him perfect performance of guard and other military duty;—hence, the much abused "soldier business."

Skeptics laugh at the singing of the apprentice seamen, and refer to the "singing school." Perhaps, if these skeptics will read the annual reports of the chief surgeons of the Continental armies and navies where may be found the statement that singing is the best known exercise for the lungs, this point will receive less criticism; and if the critic will consider how little of the Star Spangled Banner *he* can recite, much less sing, no doubt he will approve of the course pursued.

Others are mildly indignant that the instructors should be saluted by sentinels, and addressed as Mr. The instructor, who is a chief petty officer, is filling a position, to *his* men, more important than is a divisional officer at sea to *his* men; in order that discipline may be kept to a high mark, the administrators thereof must be respected and treated with respect.

The uniform is more or less a subject of criticism; the leggings and rubber boots receiving the major share—if the critics will march in formation for a few hours, in the dust so caused, they will be glad to adopt the much abused legging. As to the boots, it is impossible to have the men barefoot, while wet leather shoes are conducive to colds, pneumonia and worse things.

No deserved criticism derogatory to the training system can be made, because, as stated elsewhere, for the time expended, the present results cannot be exceeded—but an addition or an extension—a post-graduate course, is needed.

From the training stations, the men are sent to the ships, most of them to the armored cruisers and battleships, where, with their ship and gun drills, and the necessary cleaning work, there is no time for sailor training. The lads do well at their work and serve admirably as peace crews, but their coxswains and boatswain's mates, except in a very few instances, are not sailors.

Even if there were time to teach the ordinary seamen a little seamanship, who is going to do it? One or two of the older officers might be able to undertake the job; or, perhaps, one or two of the petty officers, provided the ship were fortunate enough to boast of any sailors forward; the midshipmen and

ounger officers have had no training to permit of their do his work, while most of the deck petty officers are only a f ears removed from the barracks; so the ordinary seaman scr aint-works and clean-bright-works himself into seaman and c o coxswain and boatswain's mate with practically none of th andiness, alertness or initiative of the seaman and certainl vith none of his sailor knowledge. Under ordinary circum tances, this man may no doubt be able to handle his part of th hip, or to take his gangway in port, or his watch at sea, but l im be bringing off sand and get caught in a squall, or let him t n watch at sea when it becomes necessary to secure for sudde ad weather—when things must be really secure—the chanc re that he will be found wanting. The system will be to blam ot the man; it will be *our* fault for not having him proper rained.

Many persons believe that the efficiency of our navy would l ncreased 100 per cent if every officer and man were a train nd thorough seaman. By many officers, this is denied, but r ne has denied that we should have a modicum of sailor men he crew, and that the deck petty officers and the *boatswai* hould be sailors. It is often advanced that a knowledge eamanship is useless to an officer; if so, it would be better lose Annapolis, and borrow from the second lieutenants of tl rmy. The argument is often made that all the necessary se nanship can be learned in a battleship. Maybe it *can*, but sn't.

The history of the future will bear out the assertion, th ther things being equal, superior seamanship will decide the s attles.

Let us glance at our naval commanders of the past, and s vhere they received the groundwork on which their man-of-w ecords have been built. The only training Paul Jones had f var was in a sailing ship; Worden, who, it must be admitte new how to handle an iron-clad, learned his profession und ail; and so, we can run down our history, taking Farrag Porter, Foote, or Sampson; or, in times of peace, the erstwh ommanders of our fleets and first-class ships.

With these examples, and with so many of our senior offic nd enlisted men insisting that their training under sail is one heir most valued assets, it seems that those who say we sh

have no sailors are taking a tremendous responsibility and making a most perilous change, with no more authority than the "I think so" of men who cannot say, "I know it."

Sometimes, one is tempted to believe that the "no sailor" argument is advanced through jealousy by those who, knowing that they have no sailor knowledge, wish to erase it from the service; they, no doubt, are abetted in their argument by others, who are so thoroughly grounded in sailor knowledge, that, while perfectly sincere, they forget its importance and throw their weight with the unbelievers.

We have trade schools in the navy for all trades except our own, and we are told that the period of enlistment is too short to teach a sailor to be a sailor. This seems to be anomalous.

When we consider the time that can be spared to teach an electrician, electricity; a gunner's mate, ordnance; or the time spent in the yoeman's school, the commissary school, or the artificer's class, when we think of this, lack of time seems to be rather a weak excuse.

Let us try the following scheme:

We have four modern sailing ships in the navy, namely, *Severn*, *Intrepid*, *Cumberland* and *Boxer*, but none of them has ever made a "deep water" cruise; leaving out the consideration of the benefit to the service, why not be fair to the ships and send them, at least once, upon their lawful occasions?

Let us take the *Cumberland*, remove her extensive engineering plant, reduce her sick bay to a more nearly normal size, and send her around the world, to *train our deck petty officers*. To do this would be no great task, she would cost no more than she does now, and a large number of officers would have the satisfaction of having the experiment made.

Select her captain and officers with great care, detailing no one who objected to the service; give a full complement of midshipmen for midshipman duty in the tops and gangways and the ground work will be laid.

The crew should be made up of apprentice seamen who had finished their period of four months ashore and care should be taken in selecting only what seemed to be the best material for the purpose. The argument may be advanced here that the apprentice seamen have been in the service so short a time that a proper selection could not be made—it *could* be made. For

petty officers, she should have an abundance of deck petty officers, coxswains, boatswain's mates and quartermasters from the fleet. She should have no masters-at-arms in her, but master's-at-arms duty should be required from each petty officer. In addition, put on board, under instruction, the next year's candidates for boatswain.

Let this ship be so manned, her crew drilled for a week, and then start on a cruise around the world. For an initial cruise, let her start from Newport, and run to St. Helena, then Cape Town, Melbourne, Honolulu, Valparaiso, the river Plate, and then Newport. Make the time short, so that it would be necessary to "carry on"; everyone would be keyed up and each man would learn the vigilance, the alertness and the attention to detail so necessary to a sailor's make-up. If two ships could be sent together and make a race of it, so much the better.

This practice or training cruise, should be made as pleasant as possible for all hands, and while a particular itinerary should be laid out, the commanding officer should have the privilege of staying longer in a certain port, or making other ports, provided that the behavior of the crew was satisfactory and that the ship, by fast sailing, could still complete her voyage on time. But she should be driven in a way that would put one of the old tea clippers to shame, for you can't make sailors by drifting along under short canvas, any more than you can make stokers by practice on a cold boiler! The ideal condition would be, as before stated, to have two or three ships and race around the world.

The complement of officers should not be curtailed, for they would have plenty of work to do, and to do it well they should feel that they were having as easy a time as others.

The midshipmen should be most carefully instructed and a record kept, so that they could be known when their services were required. Put the graduates of this school on a par, at least with the graduates of the other trade schools, and we can build up in a few years, a class of "seamen sailors," who, in *their* line, will be just as good as the "seamen gunners" are in *theirs*. By this, it is not meant to give certificates of graduation and two dollars a month, only a figure of eight knot on the sleeve and a preferment for the deck ratings.

This cruise being over, each of the original apprentice seamen should wear always a figure of eight mark to distinguish him, and

if there were enough, require deck petty officers to be made only from apprentice mark men. After this system had been in effect for a few years, the requirements for eligibility to take the examination for the rank of boatswain should be changed so that this grade could be filled only by the apprentice mark men.

In conversation, officers will blandly say, " It's no use trying to use the *Cumberland* and *Intrepid,* for we wouldn't be able to make an impression; the numbers would be too small." From the re-enlistments of the past year, it would seem that the *Cumberland* alone could keep feeding into the navy about 125 apprentice mark men each year, men who would probably re-enlist. But when we consider that, in a way, the deck petty officer billets would be reserved for the apprentice mark men, it would seem but natural to suppose that even a larger percentage would stay in the service.

To select a candidate for boatswain, the letters of recommendation now required should be abolished, and in lieu thereof confidential interrogatories should be substituted,—their use will be explained later. We will suppose that the Department desires to appoint a number of boatswains: under the proposed scheme, the captains of ships would be informed and they would select from among their deck petty officers, those that they considered promising material. These men would at once receive a preliminary examination by a Board of Officers from their own ship: if recommended by that board, these men should be rated at once, chief boatswain's mates, and put to do the duty, *in a battleship.* After a year of probationary duty, *in a battleship or armored cruiser,* the candidates should be examined again by a board from their own ship, and if qualified, rated with permanent appointments. This being accomplished, the candidates should be sent to the training stations, where they should spend a year as instructors and during that time make a sailing ship cruise. They would then be ready for final examination. This final examination should be searching in its seamanship and ability to handle men.

Prior to this final examination, the Department should send to the officers under whom these candidates had served *as deck petty officers,* the confidential interrogatories mentioned before, to be used for the guidance of the Final Examining Board. The Final Examining Board would then have a good measure of the

men, and this method would eliminate from the rank of boat-swain all but sailors.

The requirement for eligibility for the preliminary selection for boatswain should be that,—the candidate be a native born citizen of the United States, not less than 25 years of age, under continuous service, have made at least one sailing ship voyage, and hold at least one good conduct medal. Starting with these qualifications, the two years' training would give a candidate fo final examination who would be fit to take the examination. Th age limit has been set at a minimum of 25 years, so as to gi a man of 27 for warranting. If the provisions mentioned b enforced, why should a man be barred from the rank of boa swain because he happens to have been born more than 35 yea ago? By setting the age as stated, a much more useful class o men will be obtained.

Some years ago, the line of the navy had to take up the eng neering problem, and a few years later, a tremendous impulse wa given to gunnery, so that between the two, seamanship was lo sight of, and bids fair to stay lost. It has descended into a po tion approaching disrepute but it cannot remain there ev though some of our officers express such a strong contempt f a sailor.

How many of us, as officers-of-the-deck, have wanted to scr the flag staff, or reeve off signal halliards, or heave a line, a how many of us have *not* sent to the boatswain's mate and ask if there were a sailor in the ship?

The few sailors in a modern ship should wear on their cap ri bons, "*We need Thee every hour.*"

If the sailor is so badly needed now, in the piping times peace, when everything is intact and running smoothly, how mu more badly will he be needed when grim war knocks upon th door and our navy, perhaps crippled from battle and storm, called upon to repel the enemy? Let us leave no stone unturned our search for efficiency, no point neglected now, to our sha later on.

But, through it all, hear the opposition: "*We do not ne sailors.*"

Let us look at the matter from another standpoint. The na is a great organization and we might profit from other gre organizations. What they do to earn their dividends, we mig

lly well do to our profit. The White Star Line, the North nan-Lloyds, the Nippon Yusen Kaisha, and others, not only ı all their deck officers in sailing ships, but will not have a officer otherwise trained. If they must do it, it would seem we must do the same.

he more specific statements herein, have related to the sailor ities of officers, but no suggestions for a change in the Naval demy practice cruises is made—that was settled years ago by ıard, and we know that boards, like kings, can do no wrong. vever there has been no board to forbid the regeneration of sailor.

'o change is asked, unless it be in the selection of candidates boatswain, only the help of our officers to put two inoffensive ‹s into sea commission *to train our deck petty officers.*

"In time of danger, not before,
God and the sailor, we alike adore.
The danger past, both are alike requited,
God is forgotten—the sailor slighted."

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTES ON THE OVER-SEA TRANSPORT OF MEN.

By LIEUTENANT PAUL FOLEY, U. S. Navy.

Emergencies involving the over-sea transport of military or naval detachments arise more frequently by far than casual thought might suggest. In little under three years the routine of cruising duty in two ships of similar type has forced the attention of the writer upon the intimate details attending the embarkation of over twenty thousand men, almost fifty per cent of the total enlisted strength of the navy.

For varying periods, in summer, spring and winter; in temperate zone and tropics; the forces embarked have included civilians, naval reserves, apprentices, short-time men, battleship drafts, fleet brigades under arms, and marine regiments with all the impedimenta of a large expeditionary force.

The problems of transport are not trivial. Wherever men are subjected to the ordinary hazards of navigation there must be, irrespective of the interval for which they embark, law, order and discipline. It is something of a problem to attain it with a minimum of inconvenience to the personnel both of the transport and of the forces transported, and bad organization can defeat its intended purpose to a degree better imagined than experienced. It is a matter of official report that the conditions existant upon transports during the Spanish-American War were worse than intolerable; that the troops were unclean in their persons; that lice and vermin were rampant; that the men spit on the decks; threw waste food on the decks; and even defecated there; and that they ran aloft as they pleased, and exposed themselves to the risk of falling overboard.

Because of such reports, and because the bulk of this transportation has been effected in vessels of similar type, both on

the Atlantic and Pacific coasts, and will continue to be so effected, especially in time of war, it may not be a wholly useless expenditure of effort to outline some of the fundamental principles which the diverse experiences enumerated have established.

They concern, not the broad details of embarkation, and disembarkation, of convoy, the cubical space required for man, horse and baggage, and similar phases of the subject all exhaustively discussed in the "Admiralty Manual of Seamanship," in the "Field Service Pocketbook" and elsewhere; but rather the homely details of homely ship life as administered in our own service, the assembly, messing, berthing, washing, stowing gear and general police regulations.

The Assembly.—The spar-deck gangway of a transport should be about fifteen feet wide; extend the full length of the vessel; be clear of obstructions such as gun mounts, ventilators and winches; and have sufficient head room under the skid beams to permit the execution of shoulder arms.

The considerations which determine the formation of men in such a gangway are those of adaptability to messing, convenience of disembarkation, and facility for ship's drills; it being a cardinal principle that there should be one position and one only which the individual is to assume whenever the assembly is sounded, or in other words whenever he forms at all.

When men are not under arms the customary naval practice of facing inboard on both sides has no disadvantages; but in the case of armed forces the preferable arrangement is that of facing inboard on one side, and outboard on the other, virtually forming the battalions in two lines, with the rights resting both at the same end of the ship.

This formation becomes especially useful in disembarkation at a dock, both battalions being unfolded by a movement in the same direction as "squads right," and not one by "squads right" and the other "squads left," as would be the case from the formation facing inboard.

Battalions should be designated as "senior" and "junior" rather than as "first" and "second." Instances have occurred in which the "first" battalion of a ship's organization was, as it happened, the "second" battalion of a fleet or corps organization, and the coincidence was a source of constant confusion to the petty officers.

Messing.—The elementary practice in regard to transport messing is that wherein the methods of the camp are taken afloat. There are no tables, no ship's mess gear or mess lockers or mess cooks as in naval practice; but the food, prepared at the galley, is removed in bulk to the company parade, where it is served out to the lines of soldiery passing with plate and cup and fork and spoon in hand; and who, having drawn their ration, proceed to partake thereof seated on deck in any convenient place. The meal completed, each individual proceeds to wash his own mess gear from a common tub, and then to stow it until needed in his haversack.

Unless necessity absolutely compels it, a system of this kind should have no place on a well-regulated transport.

On the gun deck, a deck so far as practicable symmetrical with the spar deck, mess tables of the standard navy type should be arranged athwartships in sufficient number to accommodate the entire force at one sitting; with standard navy mess gear, mess-lockers, and mess pans in proportion. Any less extensive equipment is undesirable.

Under such conditions the messing bill becomes merely an indication of the hatches by which, from the spar deck formation, the men are marched below.

The battalions are unfolded from the flanks simultaneously, and, moving toward the center of the gun deck, begin filling up the tables successively as so many pews in a church. No man passes any man ahead, and piping down is effected in less time than taken for description. Success, however, depends entirely upon rigid control at the first formation. No matter how thoroughly a scheme has been arranged, and its details digested and foreseen, there will almost invariably be some one with snap judgment seeking to improve and change it.

The practice of carrying food from the tables for consumption elsewhere should be summarily checked.

Cooks.—When transporting armed ship's battalions, mess cooks, additional to those parading with the marching force, should accompany the detachment; otherwise the force returns to find the meals unprepared.

Berthing.—Definition of the bulkhead limits of the berthing space is all that should be attempted.

The ideal bedding is the hammock without mattress, but hammocks even with mattresses are more satisfactory than blankets

alone, as their use practically doubles the berthing space by swing ing and caulking off.

Portable standee bunks which have been suggested for trans port use are not recommended, unless there is an additional mes deck.

The ship's company of a naval vessel assigned to temporar transport duty should be segregated and compressed to the smalles possible compass. By allowing the politicians and idlers in gen eral to seek their several hives for the time being, it practicall absorbs itself, and the danger of smoking or other disorder below is more remote than it would be with the orlop decks assigned to strangers.

Washing.—The simplest solution is that of carrying the fresh water service to the spar deck, where a sufficient number of faucets, two to each side are ample, can be regulated by respon sible petty officers, and where no individual however sea-sick can shirk his morning scrub of person and clothing.

At least one wash bucket per squad transported should be provided. Salt water showers should be rigged under the skid

Mirrors and whisk brooms, placed on the spar deck, at appr priate intervals, and secured by chains as in a hotel toilet room are a great convenience.

Washing in the open may be somewhat disagreeable at time but it leaves the gun deck clear for the master-at-arms, the me cooks, and breakfast; considerations of no small importance.

The most successful general practice is that of restricting the morning watch to scrubbing of person and underclothing. Th afternoon drill period can then be devoted entirely to brushin outer clothing, scrubbing haversacks, leggings, belts, and knap sacks, and shaking out of blankets. A force of men responds a routine of this kind in marvelously short order.

Barbers.—One or more should accompany each battalion trans ported.

Clothes Lines.—It is desirable to have separate clothes lines fo each organization transported.

Stores and Baggage.—The impedimenta of an expeditionar force may be segregated roughly into four classes, *quartermaster's stores,* tentage, field and camp equipage and clothing; *commissary stores,* provisions; *ordnance stores,* including field artillery, smal arms, and ammunition; *personal baggage,* both of officers and men

QUARTERMASTER'S STORES.

The equipage of a marine regiment of eight hundred men ould include:

NO.		ARTICLE.	CUBIC FEET.
310	Boxes.	Tents	3000
500	Bundles.	Tent poles	500
125	Boxes.	Tent pins	500
200	"	Cots	1200
40	"	Cot nets	325
20	"	Field ovens	400
300	"	Clothing	2500
500	"	Miscellaneous gear-running 6 cu. ft.	900
400	"	Ammunition	800

Total 2700 boxes, occupying 18,000 cubic feet of space and veraging about 75 cubic feet to ton or a total of 240 tons. Average size of box, 6 cubic feet. Largest boxes not over 9 cubic feet.

COMMISSARY STORES.

The current practice of the Navy Department is to allot pay partment stores on a basis of sixty thousand rations for a force about eight hundred men.

In concrete form sixty thousand rations would include the llowing stores, which are arranged in groups convenient for nsportation and stowage:

GROUP I.

ARTICLE.	NO. BOXES.	TOTAL CUBIC FEET.
Cocoa	8	16
Coffee	111	333
Tea	10	40
Milk	95	140
Lard	80	115
Mustard	2	3
Pepper	8	10
Salt	60	70
Spices	2	3
Extracts	8	8
Baking powder	15	18
Apples	30	60
Peaches	20	30
Prunes	22	30
Raisins	6	10

A total in group of 447 boxes, occupying about 900 cubic feet. otal weight 12 tons.

GROUP II.

ARTICLE.	NO. BOXES.	TOTAL CUBIC
Salmon	170	255
Chipped beef	55	75
Beans, lima	100	100
Corn	200	200
Peas	200	280
Beans, string	80	80
Oats, rolled	20	55
Corn starch	10	12
Apricots	75	100
Peaches	175	235
Pears	78	78

A total in group of 1163 boxes, occupying 1470 cubic Total weight 20 tons.

GROUP III.

ARTICLE.	NO. BOXES.	TOTAL CUBIC
Bacon	280	600
Beef, corned	522	670
Ham	208	160
Biscuits	200	550

A total in group of 1210 boxes, occupying 1980 cubic feet weighing 37 tons.

GROUP IV.

ARTICLE.	NO. BOXES.	TOTAL CUBIC
Flour	540	1485
Corn meal	20	50
Beans	125	250
Beans, lima, dry	10	25
Peas, split	8	12
Sugar	170	425

A total in group of 873 boxes or bags, occupying 2247 feet and weighing 37 tons.

GROUP V.

ARTICLE.	NO. BOXES.	TOTAL CUBIC
Pickles	37	50
Syrup	15	75
Vinegar	30	150

A total of 82 barrels, occupying 275 cubic feet and weigh tons.

GROUP VI.

FRESH BEEF AND VEGETABLES.

ARTICLE.	NO. BOXES.	TOTAL CUBIC FEET.
Beef	100	900
Sheep	6	
Veal	60	
Pork	40	60
Hamburger	40	60
Sausage	60	90
Bologna	60	90
Frankfurters	60	90
Ham, smoked	60	90

A total of 306 packages, occupying 1380 cubic feet and weigh-
; 12 tons.

GROUP VII.

FRESH VEGETABLES.

ARTICLE.	NO. BOXES.	TOTAL CUBIC FEET.
Potatoes	100	400
Cabbage	8	32
Carrots	5	40
Turnips	5	40
Onions	20	80

total of 138 bundles, weighing 10 tons and occupying 60 feet.

The sum total of the commissary stores aggregates 4250 pack-es, occupying 9000 cubic feet of space and weighing 134 tons. With proper supervision three working parties of one hundred n each can discharge all the quartermaster and commissary res above enumerated from a dock into a ship, or from a ship a dock, in from four to five hours. It has been done more in once in this time, but it requires close supervision to ac-nplish.

Wherever possible the commissary stores, as being consum-e en route, should go forward. In vessels of the *Dixie* type, o tons and fifty-foot beam, the tons per inch immersion are ighly 34, and the moment to change trim one inch 600-foot is. At the center of forward stowage the moment is 6 tons · inch; and at the center of after stowage about the same.

The total change of draft, due to an expeditionary force, in-ding men, is about two feet, and the change of trim by the rn with quartermaster stores aft, about 20 inches, very con-nient for good steering.

Time is saved and wear and tear on material reduced to a ninimum by rigging chutes from deck to deck.

In discharging from a ship to railroad cars, it is particularly nportant to have canvas signs stenciled ahead of time, ready or nailing on every car to show the contents thereof. As a train s backed into a shed one may think to remember, or to retain a ote book memorandum of the sequence of the cars, but if the rain is broken in transit all this becomes useless. The sign is he only thing that tells, "ammunition," "tentage," "clothing," artillery," "officers' heavy baggage," and "field bags."

Rifle Racks.—Permanent rifle racks, which can be erected in day by an able shipwright, are preferable to the ordinary ship's ifle boxes, as they not only facilitate stowage, but expedite shi rills tremendously.

Company racks should be located on the spar deck and secured o the sides of the deck houses, abreast each company parade ide curtains being used to protect the rifles from the weather.

Such rifle racks consist only of a bottom board, of two-inch lank carrying the butts, raised three or four inches above the eck by blocks; and a top board cut to receive the rifle barrel.

A company rifle rack should be cut for fifty-four pieces, not orty-eight.

Bags and Knapsacks.—Bags are on the whole preferable to napsacks for the armed ship's battalions.

They stow in equal space and give the individual far more hanges than can be provided with knapsacks. If the latter are arried, however, ditty-box racks are well adapted to horizontal towage; while a double-rod jackstay, secured to stanchions, takes are of the surplus, the sack being suspended from the rod by the houlder straps, and the rods spaced far enough apart for the acks to clear one another.

By this method the sack is accessible without removal from the od.

Ponchos and blankets, when carried, can also be slung on these od jackstays.

Temporary Hammock Nettings.—Are readily improvised in he space by using a hatch canopy with its cover in place, located n any convenient spot above decks, while below they are best isposed of by piling. A folding hammock netting, on the ferry-oat gate principle would be the real convenience.

Engine-Room Uptakes.—When stowage space on the spar deck is limited, dry and protected space for light gear, such as rifles or hammocks can be improvised in the engine-room uptakes, particularly when, as is usually the case on a transport, there is a flying gallery, or galleries around it on the inside at the gun and spar-deck levels.

Officers.—The accommodation and billeting of officers in number accompanying a detachment is ordinarily a more vexatious problem than that of controlling the enlisted personnel. It is entirely inadvisable to attempt to assign rooms to the individuals, especially when such assignment involves doubling up. The most satisfactory method is to indicate to the senior passenger the total space available for himself and subordinates, permitting him first to apportion it in accordance with his own ideas, and later adjusting "kicks."

In this connection it may be said that it is most undesirable to fit a naval transport with a large number of individual rooms, which necessarily are too small for freedom of movement, and which complicate the problem of morning police to disproportionate extent.

What is required is rather an open steerage, containing a number of chiffoniers, desk of appropriate type, a common wash room, baths, and a smoking room. The net comfort of the individual would be far greater by this, than by the cubby hole method. There should be two of these steerages, one for captains and a larger one for lieutenants. Field officers should of course have staterooms and cabins.

Mess Attendants.—Mess attendants should accompany a detachment of officers.

Mess Regulations.—Copies of the ward-room mess regulations should be posted in every officer's room.

Dinner Call.—The ward-room dinner-call should invariably be rolled off; prompt attendance at meals insisted upon, and the rule of late comers not on duty beginning with the course being served, rigidly enforced.

Officers' Baggage.—The amount of baggage for each officer should be limited to about 150 pounds; but more important than weight is the need of a standard-size officer's wardrobe-trunk.

Wine Messes.—Wine messes on a transport should not be tolerated.

The general principles discussed are reduced to concrete form in the following general order, which was used to cover the embarkation of the Nicaraguan Expeditionary Force, a full marine regiment, and also that of a naval brigade transported to Washington, D. C., for ceremonies attendant upon the unveiling of the Pulaski Memorial, in one case about eleven hundred men and in the other about six hundred men.

FORMATION.

(WHENEVER ASSEMBLY IS SOUNDED.)

1. The senior battalion will form on the starboard side of the spar deck, facing *inboard,* right resting at bridge. Special details on the right.
2. The junior battalion will form on the port side of the spar deck facing *outward,* right resting at bridge. Special details on right.
3. Band will assemble on forecastle, facing aft.

CALLS.

1. General calls *without blasts* calls ship's company.
2. Battalion call with be indicated:
   For the senior battalion by one blast.
   For the junior battalion by two blasts.
3. Buglers will repeat all calls.

BERTHING AND MESSING.

1. The senior battalions will berth and mess by companies on the starboard side of the gun deck.
2. The junior battalion will berth and mess by companies on the port side of the gun deck.
3. The band, staff petty officers and special details will berth and mess on the forward berth deck, both sides.

MARCHING BELOW.

1. The band will march through Number 1 hatch.
2. Special details follow band.
3. Right wings of battalions by Number 2 hatch, filling tables beginning forward on gun deck.
4. Left wings of battalions by Number 3 hatch, beginning amidships on the gun deck and working aft.

STOWAGE OF GEAR.

1. Rifles will be stowed on the gun deck in company racks provided.
2. Quartermaster's stores on the after-berth deck.
3. Bags, haversacks, and canteens on the gun-deck jackstays, abreast mess tables.
4. Hammocks—Right wings of battalions forward on both sides. Left wings on the half deck, both sides.

WASHING.

Brigade will wash on the spar deck. Wash water will be served out from the spar-deck plugs only.

Brigade petty officers are privileged to use the wash rooms and showers of the chief petty officers of the ship.

MESSMEN.

The messmen of each battalion under the direction of the battalion commissary stewards will, upon embarkation, fall in on the starboard side of the gun deck where they will be told off to messes.

The battalion commissary stewards will supervise their own messes at all times and will be responsible for the efficiency of the service and the condition of the gear.

Messmen will clean the gun deck and be available for call in handling provisions.

OFFICERS' SERVANTS.

1. Upon embarkation, officers' servants will assemble all officers' baggage on the half deck and fall in on the starboard side, where, under the supervision of the treasurer of the wardroom mess, they will be assigned to their stations.

EMERGENCY DRILLS.

1. If at any time while the brigade is embarked, *fire* or *collision* is sounded, the brigade will assemble at quarters and stand fast.
2. In the event of abandoning ship, the brigade will take passage in the boats nearest the point of formation.
3. Life preservers will be found on top of the deck houses.

MISCELLANEOUS INFORMATION.

1. Two messmen for each section in addition to marching force required.
2. Officers' servants, marching allowance.
3. Transport provides all mess gear.
4. Officers provide their own bed linen.
5. Details required for each battalion.
   1 captain of the head, report to Chief master-at-arms.
   1 galley dish washer, report to head ship's cook.
   1 officer of the deck's messenger.
   1 executive officer's messenger.
6. Quadruplicate muster rolls of each battalion required.
7. Two (2) messmen for each 25 men embarked.

INTELLIGENCE OFFICERS.

1. Officer of the senior battalion refer all requests for information to Lieutenant ———.
2. Officer of the junior battalion to Lieutenant ———.

PROGRAM OF EMBARKATION.

1. March on board in marching order as nearly as possible.
2. Assemble on own parade with knapsacks and rifles.
3. Stow rifles and re-assemble.
4. Mess cooks report to the chief master-at-arms on starboard side deck to be assigned by him to tables.
5. Officers' servants report to the ward-room steward.
6. Companies nearest lines of entering stores, assist in reception t
7. Other companies remain on the spar deck.
8. Stores being on board, sound assembly, publish general order sentries.
9. Dinner formation. March below; all officers present at this fon
10. After dinner stow gear.

DAILY ROUTINE.

FOR TRANSPORT.

A. M.

4.45....Assembly of buglers.
5.00....Reveille. Scrub underclothes, bathing, etc.
6.30....Trice up clothes line.
7.15....Mess gear.
7.25....Mess formation (for regiment).
7.30....Breakfast.
8.10....First call for guard mount.
8.15....Guard mount. Bright work. Turn to.
8.30....Sick call.
9.25....Officer's call.
9.30....Quarters-drill under arms.
10.30....Recall from drill.
11.45....Mess gear.
11.55....Assembly (for regiment).
12.00....Dinner.

P. M.

1.00....Turn to.
3.25....Officer's call.
3.30....Assembly for drill (scrub accoutrements, brush clothing, blankets, etc).
5.00....Recall from drill.
5.15....Mess gear.
5.30....Assembly for regiment.
6.00....Turn to.
7.30....Hammocks.

Guard and Police.

The simplest sentry arrangement is that of assigning a ful pany in rotation to guard daily, with the officers thereof on d officer of the day and guard.

The duties of such officers in general are fully outlined in the "Manual of Guard Duty." The additional duties which devolve upon them afloat are those of acting as general assistants to the officer of the deck on the bridge, in which capacity they are of inestimable value.

They should be fully dressed and on stations before reveille, and make a personal inspection to see that the hammock stowers are on their stations, and that buglers, sentries and master-at-arms are on hand to rouse the sleeping battalions with expedition and despatch.

During the morning watch they should circulate constantly about the decks, observing that there is no waste of water on the one hand, and that on the other no laggard neglects to wash his person, or scrub his underclothing; also that clothes are properly stopped on the lines provided and not hung in unauthorized places. They should see that the lower decks are properly ventilated and policed before breakfast.

Vigilance, zeal and determination exerted in the morning watch have a wholesome effect throughout the entire day.

SPECIAL POLICE REGULATIONS.

The special police regulations of a transport in her capacity as such are the following:

1. No enlisted man allowed in any of the undermentioned places except on duty.
   (1) Below the level of the berth deck.
   (2) In the officers' quarters, store rooms or pantries.
   (3) In the officers' or crew's galley.
   (4) In bakery.
   (5) In canteen.
   (6) In the several officers of the ship's departments.
   (7) On the top of the deck houses.
   (8) In the ship's boats, when hoisted.
   (9) In the pilot house.
   (10) In the dynamo room.
   (11) In the engineer's work shops.
   (12) In the rigging.
2. In the case of fire at once report to the officer of the deck.
3. Sitting on the rail is prohibited.
4. Berth-deck air ports not to be opened at any time, without authority of the officer of the deck.
5. Each company police its own berthing space.
6. Smoking on the gun deck prohibited.

7. Keep clear gangway from bridge aft on the starboard side of the s deck.
8. Keep clear of hatch gratings.
9. Lower decks to be cleared at all general calls.
10. Loafing in head prohibited.
11. Smoking in head prohibited.
12. Waste of toilet paper prohibited.
13. Refuse, newspapers or anything likely to obstruct drainage not to thrown in the heads.
14. Officers of the guard and petty officers to be fully dressed and station at reveille.
15. Battalion buglers same.
16. Petty officers of the guard and sentries to unite in rousing all har especially at reveille or night emergencies.
17. Hammock stowers on station and see that bins are stowed quic and closely.
18. In cold weather sentries see that all men are properly covered w bed clothing.

SENTRIES.

Must be posted at all times on the spar deck and in the berthing sp assigned to guard property and enforce the general police regulations.

While the number and disposition of posts varies of course with type of ship; the plan recommended of assigning one company to gu duty establishes the strength of each relief at eighteen, a sufficient stren to cover ten posts with additional men as messengers, orderlies, etc.

The disposition of such a relief follows; something from which to st it being always easier to develop than it is to imitate:

SERGEANT OF THE GUARD.

1. Will take post on gun deck, on gratings of middle hatch.
2. Will visit sentinels and inspect ship during day and once between t and midnight and at least once between midnight and reveille.
3. Will report to the officer of the deck, anything out of order.
4. Will get from the regimental sergeant major, the names of the bugl in waiting and see that they relieve the duty bugler for meals.
5. Will clear gun deck at all general calls.
6. Carry out routine duties of sergeant of the guard.
7. Report to officer of the guard when air ports are opened by pro authority.

CORPORAL OF THE GUARD.

1. Take post on spar deck, just abaft of cabin.
2. Every hour after 9.00 p. m. until reveille, make an inspection on deck. Report to the officer of the deck before going and after retu ing from each inspection.

4. See that all men are properly covered with bed clothes.
5. No air ports opened without proper authority.
6. No smoking allowed during quarters, when magazines are opened or on gun deck after 7.30 p. m., until 7.30 a. m. No smoking below gun deck.
7. In case of fire report at once to the officer of the deck.
8. Report at once to the sergeant of the guard and officer of the deck any orders which do not come through the sergeant of the guard.
9. Allow no one to sit on rail.
10. Keep a clear gang-way from the bridge aft on the starboard side of the spar deck.

ORDERS FOR BUGLERS.

Three buglers will do duty each day and will be mounted with the guard.

1. Post Number 1 will be on the bridge. The bugler on duty on bridge will act as time orderly for the officer of the deck and report to him routine calls before sounding them. He will stand the morning watch on the bridge until after guard mount. He will not leave bridge except by permission of the officer of the deck.
2. Post Number 2 will be on the gun deck just below the amid-ship hatch. He will repeat all calls sounded by Number 1. He will stand the mid-watch on the bridge.
3. Post Number 3 will be on the spar deck in the vicinity of the after main hatch. He will repeat all calls sounded by Number 1. He will stand the first watch on the bridge.

The three buglers detailed for duty the following day will be in waiting and will relieve the above buglers for meals. They shall eat at early mess with the guard so as to relieve in time.

POST NUMBER 1 (Life Buoy).

1. Post extends across spar deck in vicinity of life buoys.
2. On taking post inspect life buoys to satisfy self that they are in place.
3. In case of man overboard, pull knob releasing the buoy dropping it as close to the man as possible. Follow buoy with eye as long as possible.
4. Call corporal of the guard in case of any emergency.
5. No enlisted man allowed on your post except on duty.
6. Carry out general orders for sentinels.

POST NUMBER 2.

1. Post extends on starboard side of spar deck from after end of superstructure to bridge.
2. Keep a clear gangway from the bridge aft on this side.
3. Allow no enlisted man abaft the superstructure except on duty.
4. Allow no man to spit on decks.
5. Allow no man to sit on rail.
6. Allow no waste of paper at spigot on your post.
7. In case of fire at once report to the officer of the deck.

No man allowed on starboard side of the spar deck, abreast or forward of number three gun, except on duty.
. Call the corporal of the guard in case of any emergency.
. Carry out general orders for sentinels.

POST NUMBER 3.

Post extends on port side of spar deck from after end of superstruc to bow.
Allow no enlisted man abaft main superstructure except on duty.
Allow no one to spit on decks.
Allow no one to sit on rail.
Allow no waste water at spigot abaft the galley on your post.
In case of fire, report at once to the officer of the deck.
Keep all men away from port holes of captain's cabin.
Call the corporal of the guard in case of any emergency.
Carry out the general orders for sentinels.

POST NUMBER 4.

Post extends on gun deck around amid-ship hatch.
Keep men off hatch gratings.
Allow no one but ship's company and persons duly authorized to below gun deck.
Allow no smoking between the hours of 7.30 p. m. and 7.30 a. m.
Allow no hammock to be touched without authority.
Carry out the general orders for sentinels.

POST NUMBER 5.

. Post extends on gun deck around berth-deck hatch.
. Keep men off hatch gratings.
. Allow no one but sergeants messing below to use this hatch.
. Allow no smoking between the hours of 7.30 p. m. and 7.30 a. m.
. Allow no one to touch hammocks without proper authority.
. Carry out general orders for sentinels.

POST NUMBER 6.

. Post extends on gun deck around berth deck.
. Keep men off hatch gratings.
. Allow no one but men going to sick bay to use this hatch.
. Allow no smoking between the hours of 7.30 p. m. and 7.30 a. m.
. Carry out general orders for sentinels.

POST NUMBER 7.

1. Post extends around men's head.
2. Allow no loafing in head.
Allow no waste of toilet paper.

4. Allow no smoking in head.
5. Allow no refuse or anything to obstruct the drainage to be thrown in the heads.
6. Carry out general orders for sentinels.

POST NUMBER 8.

1. Post extends around forward hatch on berth deck.
2. Allow no one below this deck except on duty.
3. Allow no smoking on this deck.
4. Keep men clear of hatches.
5. Carry out the general orders for sentinels.

POST NUMBER 9.

1. Post extends around "mid-ship" hatch on berth deck.
2. Allow no one below this deck except on duty.
3. Allow no smoking on this deck.
4. Keep men clear of hatches.
5. Carry out the general orders for sentinels.

POST NUMBER 10.

Post extends in hold near quartermaster's stores.
Allow no one to take stores or baggage away or put anything there except in the presence of an officer or quartermaster-sergeant.
Allow no one to smoke on this deck.
See that the decks are cleared at all general calls.
Carry out the general orders for sentinels.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A NAVAL SHIP'S BOTTOM PAINT.

By Naval Constructor Henry Williams, U. S. Navy.

Considering the two main factors of resistance, namely, Skin Resistance and Wave Resistance, experience shows that for large vessels of very low speed the Skin Resistance may approach 90 per cent of the total. For ordinary vessels of moderate speed, it is usually between 70 and 80 per cent of the total.—*D. W. Taylor.*

Ship's bottom paint, and the prevention of fouling on the bottom of sea-going ships, are subjects of considerable importance to the navy, not only because of the large annual expense in painting the ships and the desirability of reducing such expense, but on account of battle efficiency, as affected by the condition of the ship's bottom. The recent interest in steaming competition will direct attention to this matter, and while it may not serve to increase the importance of the question, it will at least render it of more personal interest to officers. For the last reason justification of this present paper is sought, and it is offered with the idea of informing the service as to the general questions affecting ship's bottom paint, especially, the particular phases affecting its use on naval vessels, and the causes that led up to the manufacture of ship's bottom paints at navy yards, the methods followed in developing and testing formulæ and the results obtained from the use of the government paint.

The effect of a foul bottom on the speed, maneuvering qualities and coal consumption of a ship is well known, nevertheless a single remarkable instance will be cited as an illustration of what may be expected to occur. Recently, an armored cruiser painted at previous docking with a standard commercial ship's bottom paint, was placed in dry dock on the west coast, after having been out of dock 16 months, and was found to be very foul. An estimate of the total weight of barnacles and other growths removed was given as 600 tons, and when undocked the vessel's draft was 4½ inches less than when docked, other conditions

being the same. This was a cruising ship, the itinerary of which, since prior docking, had included cruises to South American ports and the Samoan Islands. Other similar cases where the speed and coal consumption of vessels have been affected considerably by foul bottoms are of common occurrence, and are well known to officers generally.

The question of protecting the underwater bodies of sea-going ships always has been vital, and since the use of steel for hulls has become general, a suitable paint for this purpose has been in demand. Various manufacturers offer commercially, generally under proprietary names, so-called ship's bottom paints or compositions, which are designed to effect the double purpose of protecting the bottom plating from the corrosive action of sea-water and, also, of preventing the attaching of the various marine growths, such as grass, barnacles, hydroids, etc. The necessity for the periodic docking of ships, often at intervals of less than 6 months, bears witness to the fact that so far no satisfactory ship's bottom paint has been produced; those in general use represent the best available, but all leave much to be desired.

The composition of the various commercial ship's bottom paints, their ingredients, method of manufacture and action are screened by an affected mystery as "trade secrets," by those interested in their sale—this fact more than any other probably accounts for the vagueness existing in the minds of many seafaring people on this important subject. The question, however, is one that appeals to the popular mind, especially to inventors, and patents are taken out, not only for paint compositions, but for various mechanical devices for removing or preventing fouling. Mechanical removal of barnacles without docking is, of course, at the best only a temporary expedient, as the metal thus left unprotected quickly fouls again, to say nothing of the corrosion that must be checked to prevent serious damage. The Navy Department is frequently constrained to make tests of ship's bottom paints offered by persons who are convinced that they have at last solved the difficulties. Various forms of mechanical devices for preventing fouling have been tested also, but so as the continued use of paint shows, without success in improv the situation.

Work toward improving those ship's bottom compositions give the most satisfactory results is done, generally, by inter producers, who utilize the available results in the improveme

their own product, but suppress all data that might be of advantage to competitors. This may explain the fact that literature on the subject of ship's bottom paints is generally meager, largely theoretical and often misleading.

As a general rule, bottoms of ships are painted with two different kinds of bottom paint, the anticorrosive, applied usually in two coats next to the metal, and the antifouling, applied in one coat over the anticorrosive. The function of the anticorrosive is to protect the metal, not only from the corrosive effect, which is very great, of the sea-water, but from the corrosive action of the poison which is included in most of the antifouling paints to kill marine growths. Antifouling paints may be divided generally into two classes, the varnish or "poison paints," which comprise the great majority, and the grease or wax paints, which are of the consistency of soft soap and must be heated to permit of being applied.

The commercial paints consist generally of a varnish made up largely with ordinary resin, in a vehicle consisting of the higher distilling hydrocarbons, such as benzene or naphtha, and in small quantities of turpentine and linseed oil. The pigments used for the anticorrosive paint are iron oxide, talc, china clay and zinc oxide. The antifouling varnish paints are generally similar in composition to the anticorrosive, but have, in addition, certain poisonous ingredients, the most usual poisons being the red oxide of mercury, copper oxide, arsenic, calomel and corrosive sublimate.

The commoner antifouling grease paints consist simply of a copper soap and a small percentage of copper oxide. The anticorrosive paints used under the grease paints are the same generally as those used with the varnish paints.

In order that the similarity of the various better-known brands of ship's bottom paints may be judged, a brief statement is given of the characteristics of several of these, as determined by chemical analysis by a navy yard chemist:

COMPARATIVE ANALYSES OF VARIOUS SHIP'S BOTTOM PAINTS.

"Paint A."

Anticorrosive: The pigment contains oxides of zinc and iron, with carbonate of lime in a vehicle containing benzene, resin, linseed oil and turpentine.

Antifouling: The pigment contains oxides of mercury, zinc, and iron with carbonate of lime and silica in a vehicle containing benzene, resin and linseed oil.

t B."

nticorrosive: The pigment contains oxides of zinc and iron, calcium carbonate, and silica in a vehicle containing benzene, resin and linseed oil.

ıtifouling (a): The pigment contains oxides of mercury, zinc and iron with silica in a vehicle containing zinc soap, tar, resin, linseed oil and benzene.

ıtifouling (b) : The pigment contains cuprous oxide, mercuric oxide and arsenic sulphide in a vehicle containing varnish resins, benzene and nitro-benzol.

C."

ıticorrosive: The pigment contains iron oxide, with a silicious earth similar to kaolin, and contains small quantities of aluminum, magnesium oxides, in a vehicle containing a mixture of benzol and coal tar naphtha with resin and zinc soap.

tifouling: The pigment contains a mixture of silicious earth, similar to kaolin, with iron oxide and oxides of copper and mercury in a vehicle containing coal tar naphtha and benzol with resin, copper soap and zinc soap.

D."

ticorrosive: The pigment contains an iron oxide earth and silicious matter similar to china clay, with a small percentage of zinc oxide, in a vehicle containing coal tar naphtha and light petroleum hydrocarbons with resin and small amounts of zinc soaps.

tifouling: The pigment contains an iron oxide earth, silicious matter similar to china clay, cuprous oxide and zinc white, and is free from mercury, in a vehicle containing coal tar naphtha and light petroleum hydrocarbons with resin and small amounts of zinc soaps.

E."

ticorrosive: The pigment contains an iron oxide earth, zinc white, silicious matter similar to china clay and cuprous oxide, in a vehicle of coal tar naphtha with resin and zinc linoleate.

:ifouling: The pigment contains iron oxide earth, zinc oxide, cuprous oxide, graphite and silicious matter similar to talc in a vehicle of coal tar naphtha, resin and a zinc soap.

F."

icorrosive: The pigment contains oxides of iron and zinc, silica, alumina and lime in a vehicle of linseed oil and a volatile hydrocarbonate.

ifouling: The pigment contains iron, zinc and copper oxides, silica, alumina and lime in a vehicle containing tar oil, turpentine and wood spirit.

G."

icorrosive: The pigment contains metallic brown in a vehicle of linseed oil, wood tar, wood alcohol and resins.

Antifouling: The pigment contains oxides of copper, mercury and iron, with calcium sulphate in a vehicle containing copper and mercury soaps, linseed oil and benzene.

"Paint H."

Anticorrosive: The pigment contains oxides of iron and manganese with lime in a vehicle containing linseed oil, hydrocarbons and nitro-benzol.

Antifouling: A green copper soap containing about 9 per cent of copper oxide.

"Paint I."

Anticorrosive: The pigment contains metallic brown (containing about 56 per cent of iron oxide) in a vehicle containing zinc soap, benzene, aniline oil, tar and resins.

Antifouling, green: The pigment contains about 90 per cent of Paris green (copper aceto-arsenic) and about 10 per cent of calomel in a vehicle of lead soap, aniline oil and a thick resin varnish.

It should be noted that "Paint H" and "Paint I" are of the type of so-called soap or grease paints and are applied hot.

ACTION OF SHIP'S BOTTOM PAINTS.

There is a question as to the exact nature of the action of antifouling paints in preventing marine growths, the most probable explanation appears to be, that in the case of the poison paints, the spores are killed by the soluble chlorides formed by the action of sea-water on the "poison" before they are able to attach themselves. Dead barnacles often are seen attached to the bottom of ships, and often there are evidences that others have dropped off. It does not appear likely, however, that this is due to the action of the paint, but to other causes, presumably the water in which the ships have been lying before being docked. In the case of the grease paints, the familiar exfoliation theory is generally advanced. That does not appear tenable, as the characteristics of the paint are not such as to support it, even if we do admit that it is correct in the case of copper sheathing. It seems likely that these paints, due to their softness and slippery surface, simply render the attachment of growths difficult. In any event, the popularity of this class of paints has decreased considerably, due in a measure probably to the high cost of applying them.

There is an undoubted variation in the efficiency of paints, depending on the waters, the season of the year, etc. A paint that may give excellent results at one time, may, in other waters or at other seasons in the same waters, fail entirely to protect from

fouling. Furthermore, there is a difference in result, due to conditions not understood which make the barnacle crop vary from year to year. The apparent results are affected frequently by the vessel's stay at the dockyard prior to docking, as the water may be fresh, as at Philadelphia, or it may contain foreign substances, as at New York, in both of which cases the barnacles die and frequently fall off.

Since the 1900 edition, the Navy Regulations have required that, wherever practicable, paint of the same nature as that previously used shall be employed on the bottom of naval vessels. This requirement was based on the idea, which appears to be to some extent erroneous, that different kinds of paint of differing compositions affect each other deleteriously, and that the best results can be obtained only when different kinds are not used on the same bottom. This idea was so firmly fixed that this provision of the regulations was interpreted by one Secretary of the Navy to require that the same brand should be used wherever practicable, and instructions to this end were issued to the paint boards at all navy yards. This resulted in requiring the purchase, at manufacturers' own prices named without competition, of the necessary supplies of various brands of ship-bottom paints. It was left to the shipbuilder to apply any one of the approved brands of paint to the bottom of a vessel building under contract, and the subsequent use of whatever brand he chose became in this way imposed to some extent on the Navy Department. The conditions resulting from this practice became intolerable, as the prices paid for supplies of ship's bottom paint purchased without competition were excessive, and manufacturers of other ship's bottom paints than those commonly approved and used became insistent in their demands for recognition and to be given a chance to compete for the ship's bottom paint contracts.

Realization of the undesirable features of these conditions and the wish to remedy them, coupled with the information that patent rights on certain proprietary formulæ for ship's bottom paints had expired and thus become public property, led the department to the decision in 1906, to experiment in the development and manufacture at a navy yard of a suitable ship's bottom paint for naval purposes. With this in view, experiments were undertaken simultaneously at the navy yards, Norfolk and New York; and a vast amount of work was done in experimentation on various compositions.

At Norfolk a number of formulæ were developed, most of them involving the use of a varnish vehicle made with alcohol and shellac. These were tested out primarily by application to steel plates for submergence along the water front. Those which gave the best results in this test were tested further by being applied in patches to the bottom of several coal barges, along with one or more of the standard proprietary brands, to determine whether the results obtained from the paints under test were comparable with those that would be obtained from the paints previously used. In this manner, by a process of elimination, the formula for the most efficient ship's bottom paint was selected from the large number that were tried. The bottom of a collier was then painted with this paint and, the result obtained proving satisfactory, it was decided to apply paint of this composition to portions of the bottoms of two of the battleships that were then about to start on the cruise around the world with the fleet.

It is a general rule of the Navy Department in applying two kinds of ship's bottom paints to the bottom of a vessel for comparison, to divide the bottom into four quarters, each of the kinds of paint being applied to the forward quarter on one side and the after quarter on the other side. This is to ensure that both paints will be subjected to the same conditions, as frequently one side is more exposed to fouling or corrosion than the other.

The Norfolk paint was applied in this manner to one-half of each side of the U. S. S. *Minnesota* and the U. S. S. *Kentucky*, the other half of each being painted with the proprietary paint which had been applied previously to each vessel. In this way, a direct comparative test of the quality of the Norfolk paint was obtained with two approved brands of proprietary paint. At the docking of the vessels on the west coast, the condition of the portions coated with the Norfolk paint was found to be most satisfactory and compared favorably with the portions covered by the proprietary paints, as well as with the condition of the bottoms of other vessels of the fleet. The bottoms of the *Minnesota* and *Kentucky* were repainted as before to continue the experiment. Upon the return of the fleet to home waters, the *Minnesota* only was docked, the *Kentucky* being laid up in ordinary. The results in the case of the *Minnesota*, coupled with previous tests, were considered to be sufficiently conclusive to warrant an extension of the use of the Norfolk paint to the

bottoms of other vessels, although the comparative tests between it and other proprietary paints were continued on a number of battleships in the manner referred to above.

The Norfolk paint, therefore, was applied at the spring docking in 1909, to the entire bottoms of the *Minnesota* and *Louisiana*, and to portions of the bottoms of the *Connecticut, Nebraska, Georgia, Mississippi, Idaho, New Jersey, Missouri, Vermont, Virginia, North Carolina, Montana, Wisconsin* and *New Hampshire*.

At the fall docking in 1909 of the battleship fleet, the Norfolk paint was found to have given results quite as good and in many cases better than the proprietary paints with which it was in comparison and, with this in view, the Department ordered the still further extension of the use of the government paint. The comparative tests were continued only on the *New Hampshire, Wisconsin, New Jersey, Rhode Island, Connecticut, Nebraska* and *Mississippi*, other vessels having the Norfolk paint applied to their entire bottoms. Continued good reports being received as to the results from the Norfolk paint, at the spring docking in 1910, the number of ships on which the proprietary paints were used was still further reduced, and at the fall docking in 1910, the Department directed the discontinuance of comparative tests of the character referred to, except in such special cases as might arise from time to time.

This action amounted in effect to the adoption for general use on naval vessels of the ship's bottom paint developed and largely manufactured at the Norfolk Navy Yard. At the present time practically all naval vessels have their bottoms so painted, and this fact appears to justify a discussion of its composition, characteristics, methods of manufacture and application, cost of production and advantages derived from its use.

Composition and Characteristics.

As has been noted, the paint consists of a varnish vehicle of shellac in alcohol, with the addition of small percentages of turpentine and pine-tar oil. The pigment for the anticorrosive consists of dry metallic zinc dust and dry white zinc oxide, the exact ingredients for making 10 gallons of the anticorrosive paint being as follows:

7¼ gallons grain alcohol.
7-9/10 pounds gum shellac.
3/5 gallon turpentine.
3/5 gallon pine-tar oil.
9½ pounds metallic zinc, dry.
28½ pounds white zinc oxide, dry.

The pigment for the antifouling consists of dry white zinc oxide, Indian red and red oxide of mercury, the exact ingredients for making 10 gallons of antifouling paint being as follows:

6 gallons grain alcohol.
13¾ pounds gum shellac.
1 gallon pine-tar oil.
1 gallon turpentine.
13¾ pounds white zinc oxide, dry.
13¾ pounds Indian red.
4¾ pounds red oxide of mercury, dry.

In mixing the paint in quantities, the requisite amounts of alcohol and shellac are dumped into the shellac cutter and the cutter turned for about four hours, and allowed to stand over night. The mixture is then drawn into large change tanks and the other liquids added. The dry ingredients are mixed separately and ground through the paint mills with a small quantity of the liquids and the mixture is added to the bulk of the liquid vehicle in the change tank and stirred to ensure thorough mixing. The paint is put into 10-gallon steel drums and each full drum is weighed to assure that the proper amount of paint is contained. The drums are sealed carefully to prevent loss by evaporation of the alcohol.

The anticorrosive paint resulting is of a light gray color, somewhat thin. The antifouling paint is thicker and of a dark red color. In both of these paints the pigment has a tendency to settle and for that reason care must be taken to ensure the thorough stirring of the paint before use. Due to the affinity of alcohol for water and to the fact that its addition to the paint causes the shellac to precipitate, great care must be exercised to prevent water from getting into the drums or paint buckets. If the bottom of the ship is very wet, it is necessary that free water be wiped off before applying the paint.

Before the paint is applied to the bottom of a vessel, all fouling matter and loose paint should be removed. Old paint that ad-

heres need not be removed, except that if grease paints have been used all such paint must be removed, as the Norfolk paint will not adhere to it.

COST OF PRODUCTION.

The cost of production of the Norfolk paint is fixed by the cost of the raw ingredients, which is subject to some variation. For example, the shellac has varied from 14 cents per pound to 17¾ cents, the price on the last annual contract which covered 500,000 pounds. Similarly, the cost of the alcohol, which is obtained tax free, varies somewhat, the price averaging about 35 cents per gallon. The other ingredients vary in price but little. The 10-gallon drums cost about $1.50 each and can be manufactured at the Norfolk yard at considerably less cost than if purchased. They can be used repeatedly, so that their cost is distributed over a number of gallons of paint. The labor charges for the manufacture of the paint do not exceed 3½ cents per gallon.

ADVANTAGES THROUGH THE USE OF GOVERNMENT PAINT.

The advantages derived by the navy through the use of ship's bottom paint of its own manufacture are very considerable, and, while the considerations which impelled the Navy Department were largely pecuniary, other advantages have developed. The pecuniary advantages may be stated briefly. Estimates made in 1910 of the cost of paint for the bottoms of all vessels on the navy list, using the kinds of proprietary brands of paint that were purchased usually prior to 1908 and distributed among the ships in the proportions of each brand then customary and at the prices then current, show that the cost of the paint for a single painting of the bottoms of all vessels of the navy, not including coal barges, etc., under the conditions noted, would have been somewhat more than $100,000. The cost of an equal amount of the Norfolk ship's bottom paint at the prevailing cost of manufacture would be less than $33,000. As a majority of the vessels of the navy are painted twice a year, it will be seen that the annual saving to the government by this means at the present time is probably not less than $100,000 annually. It should be noted, however, that largely as a result of the government entering the field with its own paint, the prices asked for ship's bottom paint

by various firms previously supplying the navy, have been so reduced that if for expediency or some other reason the Navy Department decided in the future to purchase all or a portion of its ship's bottom paint, there still would remain an appreciable saving to be credited to the Norfolk paint.

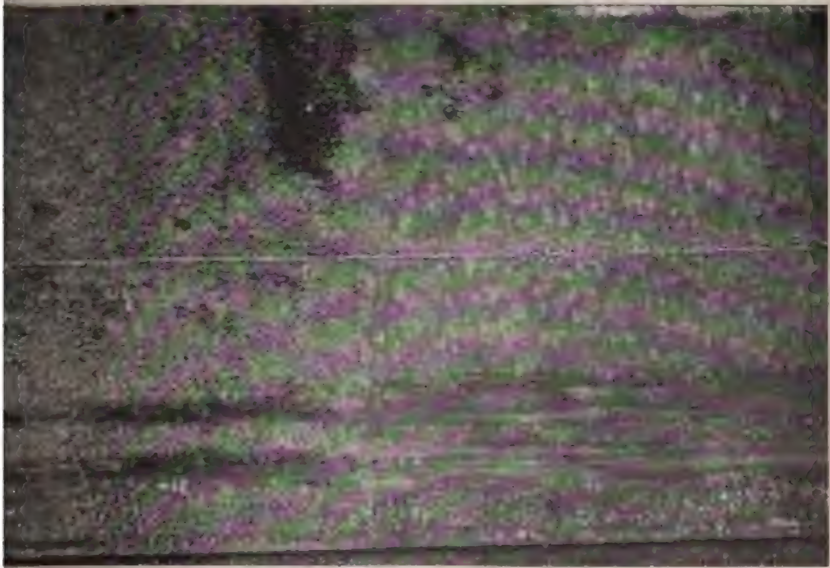
Another advantage besides the pecuniary one which the navy derives from the manufacture of its ship's bottom paint is the elimination of delay frequently incident upon the purchase and delivery of articles of this character. The materials from which the Norfolk paint now is manufactured are of a character readily obtainable and some of them are usually in stock at any navy yard. This permits of prompt production of ship's bottom paint as required. The capacity of the plant at the navy yard, Norfolk, is not less than 500 gallons per day of 8 hours, or 1500 gallons if working in three shifts. So far, no other yard, except Cavite, has been authorized to manufacture this paint, but, in case of necessity, there is nothing to prevent any of the large navy yards from doing so. This paint is manufactured and successfully used at the naval station, Cavite, and considerable advantage has been derived from this fact, in rendering unnecessary the shipment at periodic intervals of large quantities of ship-bottom paint, which, when stored, is subject to deterioration. The use of the Norfolk paint on vessels in these waters has been attended with uniform success, a report received in November, 1910, stating that the Norfolk paint had given better results than any other kind of ship's bottom paint tried. As those waters cause considerable fouling, it is obviously of great advantage to use an efficient bottom paint. The facilities for the manufacture of the paint at Cavite are good, and the output can be made as high as 1000 gallons a day. This, combined with the capacity of the floating dry dock *Dewey* for rapid docking of vessels, would render possible the prompt docking of a fleet in these waters in cases of emergency. Similar satisfactory results have been obtained in the waters at Honolulu, which are well known to cause excessive fouling.

The navy derives still further advantage from manufacturing its own paint due to the increased knowledge of the properties and effects of ship's bottom paints and their various ingredients gained from the experiments conducted in that connection. The government has already in its employ at various navy yards skill-

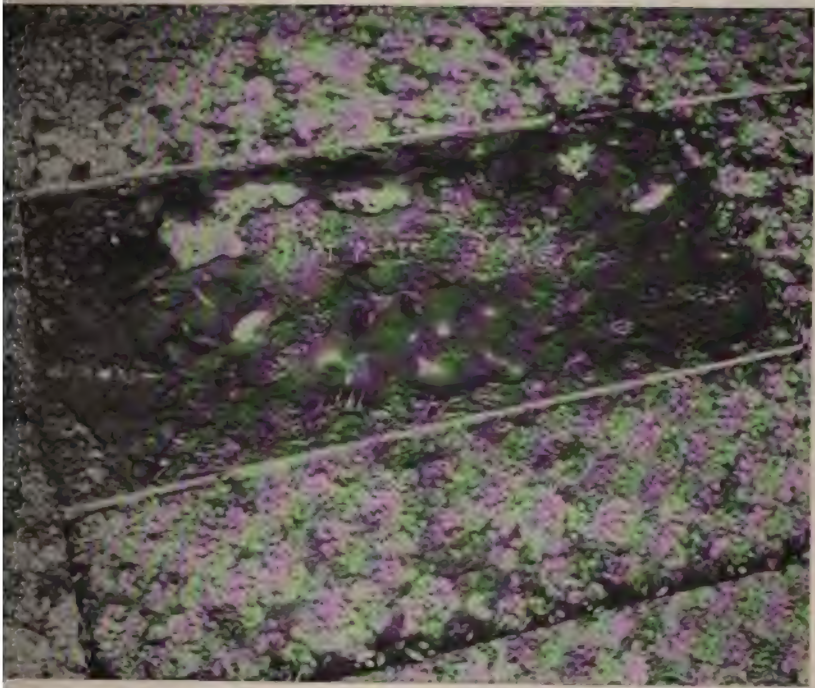
ful chemists, laboratorians and painters. The abilities of these persons are thus rendered available for experimenting on and improving the ship's bottom paints. As has been noted, experiments heretofore conducted along these lines have been carried out by persons interested in some particular brand of paint. Now that the Navy Department has taken up this matter, undoubted benefit will be derived, not only to the navy, but also to the shipping interests generally, and it is not unreasonable to hope that the ultimate result may be an ideal ship's bottom paint, permitting a vessel to remain in the water for several years without fouling.

Objections have been raised as to the propriety of the government undertaking the manufacture of a commercial article, such as ship's bottom paint, and thus entering the field in competition with private firms. No justification seems necessary in addition to the facts already pointed out. However, it should be remembered that manufacture of ship's bottom paint consists merely of mixing raw ingredients which are purchased. Each navy yard is already equipped with adequate machinery for this purpose, and actually does of necessity mix paints for various other purposes. Additional work that can, in reason, be given to the paint mixers increases their efficiency and that of the plant. Private shipyards generally have paint mixing plants similar to those in navy yards, though naturally much smaller. At least one such private yard takes advantage of its facilities for the manufacture of ship's bottom paint for use on vessels docking in its dry docks. The navy is the largest consumer of paint in the country, and if a comparatively small shipyard finds it desirable to manufacture its own supply, how much more advantageous will it prove to the Navy Department.

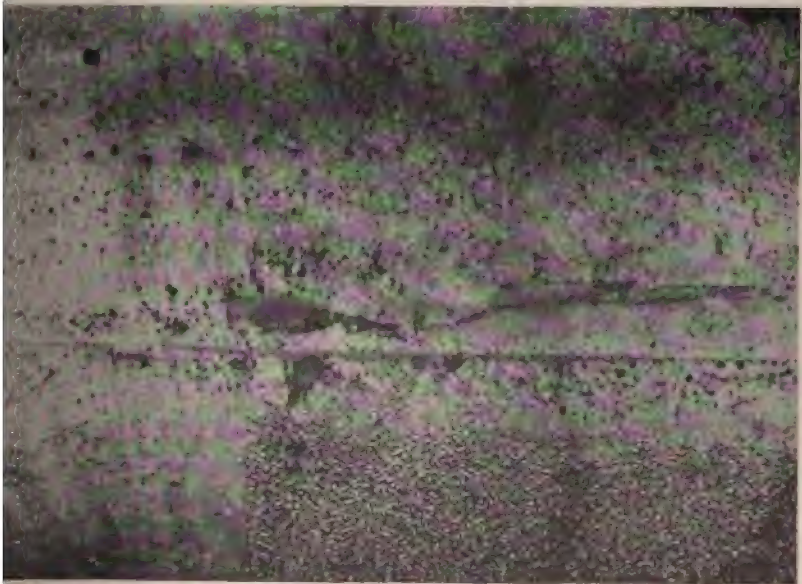
f a yard tug showing a test paint developed at Norfolk Navy Yard on left, in comparison with brand commercial paint on right.



photograph showing condition of bottom of a battleship painted with Norfolk paint on right in with a standard brand on left.



of a vessel's bottom resulting from a test of a mechanical device for preventing fouling and
means of electrolytic action.



a coal barge showing a test paint developed at New York Navy Yard on left, and a com-
on right.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ANTIQUITY OF TWO NAVAL ACADEMY GUNS.

By WILLIAM O. STEVENS, Professor of English,
U. S. Naval Academy.

The inventory of trophies at the Naval Academy contains the names of two ancient cannon; one, a "Corean gun of 1313," and the other the "Cortez gun of about 1474." These dates rest on the conclusions reached in an article published in the PROCEEDINGS OF THE NAVAL INSTITUTE for 1892, "Notes on the Date of Manufacture of the Three Guns at the U. S. Naval Academy, Captured in Corea by Rear-Admiral John Rodgers, U. S. N.," by Thomas Wm. Clarke.

Apparently in the nineteen years since that article appeared these figures have never been challenged, and yet if they are to be accepted they are of extraordinary interest. In that case the Naval Academy possesses, in the Corean gun of 1313, an example of ancient artillery which should upset all the accepted ideas on the history of ordnance: and, in the Cortez gun, the most remarkable specimen of 15th century cannon in existence.

I. "THE COREAN GUN OF 1313."

This is a small brass gun lying on the floor at the left of the north door of the Naval Academy armory. Together with two others almost exactly like it in the armory and one now at Fortress Monroe, it was brought to this country by Rear-Admiral Rodgers in 1871. As all four were taken from a river fort in Corea, they are usually referred to as Corean guns, though they are of Chinese manufacture and bear Chinese inscriptions.

Of the three in the armory one stands on a swivel in a corner of the vestibule to the left. This swivel is of modern manufacture, but serves to show how all three were originally

mounted. The other two lie on the floor to the right and left of the entrance. They all bear inscriptions which, in the case of two, settle the date of their manufacture. The one mounted on a swivel was made in 1680, and the one lying to the right of the door in 1665. In the inscription on the third gun there is an omission of title which makes the date problematical, and this is the one which Mr. Clarke concluded came out of a Chinese foundry as long ago as 1313.

This omission comes at the head of one of the columns of the inscription. Instead of beginning, as the wording does on the other two, with the regal or imperial title, this starts off simply with the Chinese date, the fiftieth year in a cycle of sixty years, eighth month. As far as this information goes—and here I am following the calculations of Mr. Clarke—the date may fall in 1253, 1313, 1373, 1433, 1493, 1553, 1613 or 1673. Years before 1253 and after 1673 need not be considered.

To account for the omision of the title, Mr. Clarke is of the opinion that " some event happened which rendered the engraver doubtful about the regnal title and caused him to leave a blank in this part of the inscription to be filled in when the doubt was solved." Apparently in the case of this gun it left the foundry with the doubt never solved. " Such a doubt," he continues, " could only arise on an impending change of regnal title. If, therefore, we can find some Kwei Chow (fiftieth) years . . . in which in the eighth month a change of regnal title was impending, we shall have an indication to assist us to the exact cycle of sixty " to which this gun belongs.

By reviewing Chinese history, he finds that in 1314, on New Year's Day, the Emperor changed his title. At no other date near a Kwei Chow year can an emperor be found changing his title. Therefore the year 1313 must be correct. This applies also to the Corean gun at Fortress Monroe, whose inscription is equally lacking in " regnal title."

Accepting this conclusion for the present, let us see what it compels us to believe. The gun is described in the inscription as a " 5th class Fulangki (cannon) No. 229, weight 100 catties." It means, therefore, that as early as 1313, before the dawn of artillery in Europe, China had at least five classes of cannon and that there were at least 229 of this class. But a curious thing about it is that this cannon foundry and the very existence of

the guns themselves must have been a profound secret, for not one of the travelers from Marco Polo down discovered anything of the sort and no records of them exist in Chinese history. By a remarkable coincidence, Europeans, in the latter part of the 16th century, invented exactly the same, peculiar type of cannon with its open breech and movable, hooked "iron," with the same characteristics of design and ornament. They could not have learned it from the Chinese for, long before that time, the art had become extinct in China. The latter must have not only forgotten the use and the manufacture of artillery but also lost temporarily all the guns that had been cast in the early days; because, in the 17th century, when the Emperor desired cannon for his armies, he had to call on a Jesuit missionary to design a pattern and direct the casting. The other two Corean guns belong to this late period; and, as they are identical in type with this piece of 1313, we must believe that by another coincidence the Jesuits taught the Chinese exactly the same kind of gun which the latter had invented three centuries before but had strangely forgotten. By still another coincidence the Chinese re-invented the same meaningless word for "cannon" which they had applied to the forgotten guns, namely, "Fulangki."

To balance this mass of improbability on the assumption that the omission in the inscription could have occurred only because the Emperor was on the point of changing his title, and that we know all who did contemplate such a change, seems a doubtful matter at best. As it happens, there is unquestionable evidence to the contrary.

Professor F. Wells Williams, of the chair of Oriental History at Yale, kindly furnished me with information in regard to the origin of the word "fulangki" just mentioned. "The word," he writes, "did not exist in Chinese until they heard the Malay interpreters call the Portuguese 'Franks' or 'Farangki,' which can only be pronounced Fulangki by the Chinamen because they are unable to utter the sound of r. The Portuguese, as every one knows, first got to Canton in 1517. First applied to the Portuguese, the term was afterward given to their guns." Therefore the point that the Corean gun in question could not be earlier than the 16th century he says, "is proven beyond cavil."

In the Javanese section of the Museum für Völkerkunde at Berlin may be found an almost exact duplicate of this gun, bear-

the Portuguese arms on its breech, and the label reads, "Of the 16th or 17th century." Of the possible dates in the Kwei Chow cycles given above, 1553 would probably be not too early and 1613 not too late for the casting of such a gun in Europe; but unless evidence is forthcoming to show that the Chinese were manufacturing their own cannon as early as these dates, they must be rejected. According to Mr. Clarke, as late as 1621, when there were a few small guns available for the Chinese forces, Portuguese engineers had to be employed to handle them. It was not till 1636 that the Jesuit, Father Schaal, was ordered by the Emperor to instruct workmen in the art of manufacturing cannon. A few years after his death in 1666 another Jesuit missionary was appointed to the same office. The last of the possible dates, 1673, seems then, not only by the process of elimination but by the evidence of history, to be the probable year. It also accords well with the dates of the other two Corean guns, which it so closely resembles.

II. "THE CORTEZ GUN."

This is a brass gun, much larger than the Corean guns and resting on a carriage at the right of the vestibule of the Naval Academy armory. It is one of the many trophies brought back from the Mexican War, and it has always gone by the name of the "Cortez Gun." Mr. Clarke dates it "before 1474" for the following reason: By the marriage contract of Ferdinand and Isabella "it was provided in 1469 that after her access the arms of Aragon should always be associated with those of Castile and Leon, and as this gun was marked with Castile and Leon only, this fact dates it earlier than 1474"; namely, the year Isabella came to the throne.

In the first place it seems curious that Cortez, making his invasion in 1518, should have selected a gun manufactured at least 44 years previous, especially as that was a period of rapid progress in artillery. It is as if a present day filibuster were to equip himself with a smooth-bore of the Civil War. Moreover, there is no gun extant, dated as early as 1474, which is of as advanced a type as this; nor can anything like it be found in Favé's famous work on the history of artillery before the 16th century. In short, every bit of evidence that can be gleaned from extant material and the work of the most noted authority is

against the idea that this gun is earlier than the 16th century. It would be a very notable exception if Mr. Clarke's contention is true, and, as the burden of proof lies with him, his evidence must be strong inded to carry conviction.

All that he offers is the terms of the marriage contract, which provided that, after the accession, the arms of Aragon should always be associated with those of Castile and Leon. Now it is a matter of rather common experience that the terms of a contract are not always carried out to the letter, especially a marriage contract. Unfortunately, we cannot refer to other 15th century Spanish cannon, for it is doubtful if many are extant; but there is another source that may serve to prove whether the arms of Aragon were always associated with those of Castile and Leon, namely the Spanish flags of the period. Happily for our purpose we have a detailed description of the flag carried by Columbus in 1492, written by his son. It represented "an unarmed man holding a shield with the arms of *Castile and Leon*."[1] It need hardly be mentioned that Columbus was sent by Ferdinand and Isabella, but evidently their flag, under which he sailed, bore no insignia of Aragon. As this gun is supposed to have been with Cortez in his conquest of Mexico, the flag that he carried would be interesting in this connection. Fortunately, this is still preserved. On one side it has a picture of the Virgin, on the other the arms of *Castile and Leon*.[2] Clearly, after 1474 the arms of Aragon were not "always associated with those of Castile and Leon." Why then, if the national emblem itself ignored the Aragon arms, should one insist on finding them cast on the breech of a gun? It must be remembered that the present flag of Spain, which unites the two arms, dates only from 1785.

But Mr. Clarke's historical reasoning would be faulty even if it could be accepted that this clause in the contract was faithfully observed. After the death of Isabella there was a period when the unpopular Ferdinand retired to Aragon, and the two nations were no longer allied. This was from 1504 to 1507. It is absurd to suppose that a piece cast in Spain during those years would have been adorned with the arms of Aragon. As the Cortez expedition took place in 1518, it is at least quite as likely that the gun was made during those years as "before 1474."

[1] G. H. Preble, "The Flag of the U. S. and Other National Flags," p. 168.

[2] Ibid., p. 83.

All the evidence that the gun itself shows points to the 16th century. It answers to all the descriptions of the "peterero," a howitzer-like piece, open at the breech. The type was apparently of Spanish origin, and seems to have become common in Europe by the middle of the century. It was a favorite gun on shipboard in the days of Drake. If it really was one of the guns that Cortez used to conquer Mexico, that would be valuable evidence as to its age; but until the tradition can be confirmed it seems doubtful whether it is quite so old. It is safe to say, however, that it belongs somewhere in the 16th century, and as such is the most ancient of the Naval Academy guns.

... Gun.—The mount is modern, and the handle inserted in the breech is not a part of the ... but a piece of wrought iron affixed at some later period for convenience in handling. ...block, or iron, belonging in the breech of this gun has been lost.

...ean Guns.—The one lying in the immediate foreground is the so-called gun of 1313.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SARRAU'S VELOCITY FORMULA, MODIFIED FOR SMOKELESS POWDER.

By G. W. PATTERSON.

The Sarrau binomial formula for velocity, appearing in the various publications on interior ballistics, is based on experimental data obtained, using black powder. It has not been found applicable for use with smokeless powder.

About two years ago sufficient data appeared to me to be available in the records of the Naval Proving Ground for a revision of constants of this formula. Using this data, I worked out a formula, which has been found reliable for all densities of loading from 0.3 to 0.7, and is in many respects more elastic and convenient than others now in use.

The method was as follows:

Record of a lot of powder fired in two guns with different chamber capacities, all other ballistic elements remaining constant—

Gun.	Charge.	Velocity.	Chamber Capacity.
A	300 lbs.	2510 f. s.	16974 cu. in.
B	340 "	2860 "	14970 "

Then

$$\left(\frac{340}{300}\right)^x \left(\frac{14970}{16974}\right)^y = \left(\frac{2860}{2510}\right), \qquad (1)$$

and

$$x \log a + y \log b = \log c. \qquad (2)$$

Adopting the approximations of Sarrau in the general equation *

$$V = A\left(\frac{fa}{\tau}\right)^{\frac{1}{2}} \frac{\bar{\omega}^{\frac{1}{4}+r} S^{\frac{1}{2}-2r} u^r}{W^{\frac{1}{2}} C^{1-2r} \delta^{r-\frac{1}{4}}} \left[1 - B\frac{\lambda}{\tau}\,\frac{(Wu)^{\frac{1}{2}}}{C}\right], \qquad (3)$$

* NAVAL INSTITUTE, Vol. X, No. 1, page 167.

in which

$$x=\tfrac{1}{4}+r,$$
$$y=\tfrac{1}{2}-2r,$$
$$y=1-2x.$$

Then in (2)

$$x(\log a-2\log b)=\log c-\log b$$
$$x=\frac{\log c-\log b}{\log a-2\log b}.$$

Solving, (1) gives

$$x=.68,$$
$$y=-.36,$$
$$r=.43.$$

Substituting the value of r, in equation (3), we have

$$V=A\left(\frac{fa}{\tau}\right)^{\frac{1}{2}}\frac{\varpi^{.68}S^{-.36}u^{.48}}{W^{\frac{1}{2}}C^{.14}\delta^{.18}}\left[1-B\frac{\lambda}{\tau}\frac{(Wu)^{\frac{1}{2}}}{C}\right].$$

$\delta^{.18}$ is sufficiently near a constant.

Taking the nearest approximation of exponents gives

$$V=A\frac{\varpi^{.7}u^{.4}}{W^{\frac{1}{2}}S^{\frac{1}{3}}C^{\frac{1}{2}}}\left[1-B\frac{(Wu)^{\frac{1}{2}}}{C}\right],$$

in which

ϖ = charge in pounds.
u = travel of shell in feet.
W = weight of shell in pounds.
S = chamber capacity in cubic inches.
C = caliber in feet.

Representing gun constants by

$$a=\frac{u^{.4}}{W^{\frac{1}{2}}S^{\frac{1}{3}}C^{\frac{1}{2}}}.$$
$$\theta=\frac{(Wu)^{\frac{1}{2}}}{C},$$

gives the working formula

$$V=A\varpi^{.7}a[1-B\theta].$$

The following results are fair samples of what this formul will do:

Powder.	Fired in.	Velocity Calculated	Velocity Found.
I. H. X. Lot 1	8".35	2097	2100
I. H. X. Lot 1	13".35	2005	2000
I. H. X. Lot 1	7".45	2687	2700
I. H. X. Lot 1	8".45	2586	2600
I. H. L. Lot 1	6".40	2159	2150
I. H. L. Lot 1	4".50	2622	2600
I. H. L. Lot 1	6".50	2584	2600
I. H. L. Lot 1	5".50	2683	2700
I. H. C. A. Lot 11	10".30	2015	2000
I. H. C. A. Lot 11	6".50	2615	2600
D. S. B. Lot 9	6".50	2586	2600
D. S. B. Lot 9	5".40	2328	2300
D. S. A. Lot 2	4".40	2005	2000
L. R. B. Lot 1	6".50	2180	2181
I. H. D. D. Lot 2	8".45VI	2750	2740

Having found the velocity formula accurate, a graphic method was sought to show relations between constants A and B and the web thickness of standard powders.

Sarrau's formula for maximum pressure: *

$$P=Ka^2\frac{(\bar{\omega}W)^{\frac{1}{2}}}{C^2}\left(\frac{\delta\Delta}{\delta-\Delta}\right)^{\frac{1}{2}}.$$

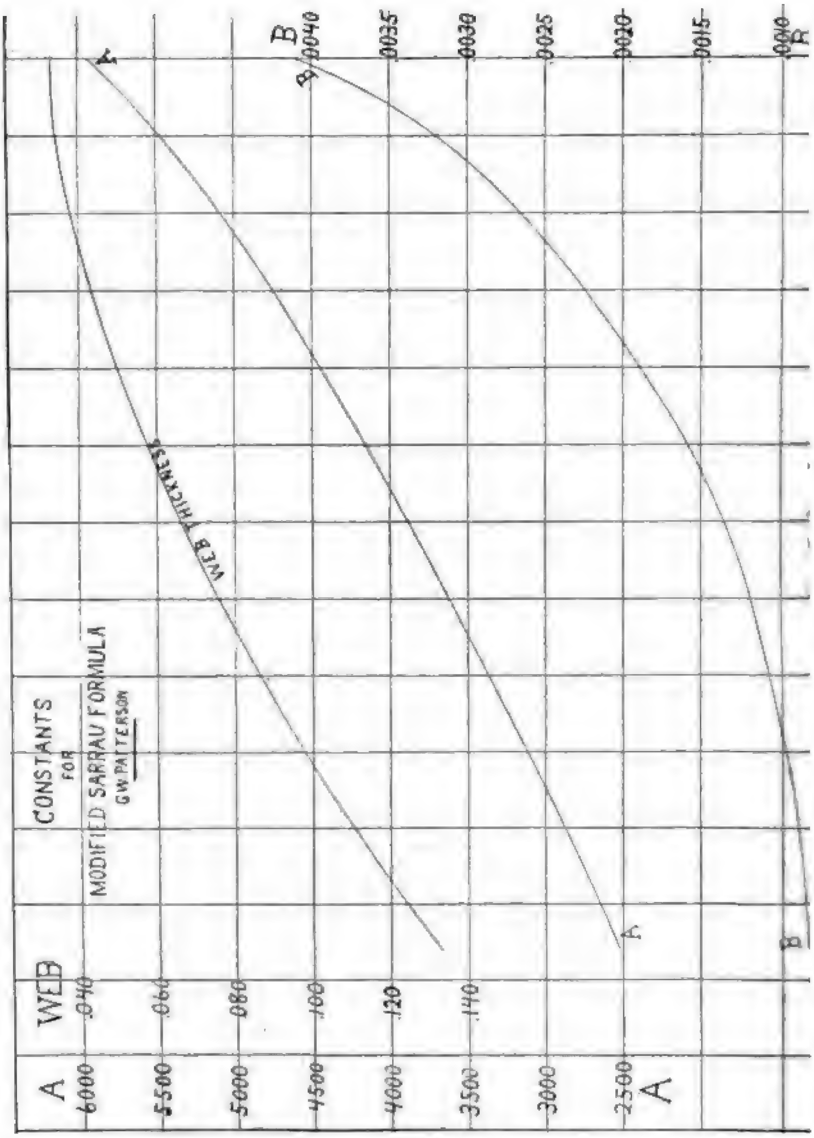
K = constant.
a = variable depending on quickness of powder.
$\bar{\omega}$ = weight of charge in pounds.
W = weight of shell in pounds.
δ = density of powder.
Δ = density of loading.
C = caliber in feet.

was found to agree reasonably well with experimental results for maximum pressures by gauges. With medium densities of loading variations were not more than 0.3 tons between calculated and experimental results in a large number of cases.

Having found the value of Ka^2 for a number of powders from the firing records, the value $a=1$ was assumed for a particular powder and the values a, A and B plotted. Faired curves for these points are shown on the appended plate. The web thickness curve is for standard navy powder of 1910, multi-perforated grain. In using the formulæ, the black ignition charge is neglected, ω being the weight of smokeless powder only.

* NAVAL INSTITUTE, Vol. X, No. 1, page 142.

While the approximations assumed may be open to criticisn the velocity formula has been particularly successful in predictin charges for unusual velocities and for new types of guns. Th pressure formula is not considered sufficiently reliable for generi use.



U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE LE DUC VELOCITY FORMULA.

By PROFESSOR PHILIP R. ALGER, U. S. Navy.

In connection with the modified Sarrau formulæ proposed by Mr. Patterson in the preceding article, it may be interesting to consider another semi-empirical formula which has been in use in the Bureau of Ordnance and at the Indian Head Proving Ground for several years past, and which gives remarkably accurate results.

This formula, which was originally found in a series of articles in the Revue d'Artillerie,* where it was designated as Captain Le Duc's semi-empirical formula, assumes the space velocity curve of a projectile in the gun to be a hyperbola whose equation

$$v = \frac{au}{b+u},$$

a and b being constants, u the travel of the projectile and v its velocity.

It will readily be seen that a is the value assumed by v when u becomes infinite, and that by varying the values of a and b the shape of the curve may be made either very flat or very much rounded so that it can represent the effect of either slow or quick powders.

In order to determine the value of a, we have to consider that it is the velocity that the projectile would attain in a gun of infinite length, and that in such a case the muzzle energy of the projectile would equal the whole work the powder charge was capable of doing.

If p is the pressure and v the volume of unit weight of a gas, and if n is the ratio of the specific heats of the gas, pv^n remains

* Théorie des affuts à Déformation. By J. Challéat, Capitaine d'artillerie. Revue d'artillerie, 1904 and 1905.

constant in adiabatic expansion, and the work done in expanding adiabatically from volume v_1 to volume v_2 is $\int_{v_1}^{v_2} pdv$.

Therefore we have

$$pv^n = k.$$

$$\text{Work}\Big]_{v_1}^{v_2} = \int_{v_1}^{v_2} pdv = k\int_{v_1}^{v_2} \frac{dv}{v^n} = \frac{k}{n-1}\left[\frac{1}{v_1^{n-1}} - \frac{1}{v_2^{n-1}}\right],$$

or, if $v_2 = \infty$,

$$\text{Work}\Big]_{v_1}^{\infty} = \frac{k}{n-1} \cdot \frac{1}{v_1^{n-1}}.$$

Hence, if we call the work done by one pound of gas in expanding from unit density (27.68 cu. in. per pound) to infinity the potential (E), we have

$$E = \frac{k}{n-1} \cdot \frac{1}{27 \cdot 68^{n-1}}.$$

And if the expansion is from any other density (Δ), to infinity, since $v_1 = \frac{27 \cdot 68}{\Delta}$, the work done will be

$$\frac{k}{n-1} \cdot \frac{1}{v_1^{n-1}} = \frac{k}{n-1} \cdot \frac{\Delta^{n-1}}{27 \cdot 68^{n-1}} = E\Delta^{n-1}.$$

This work, multiplied by the weight of the powder charge (ϖ), must equal the energy of the projectile $\left(\frac{pa^2}{2g}\right)$, and so we get

$$\frac{pa^2}{2g} = E\varpi\Delta^{n-1},$$

$$a^2 = 2gE\frac{\varpi}{p}\Delta^{n-1},$$

$$a = \sqrt{2gE}\left(\frac{\varpi}{p}\right)^{\frac{1}{2}}\Delta^{\frac{n-1}{2}}.$$

The value of $\sqrt{2gE}$ in foot second units, giving E its actual value of 653 foot-tons per pound, works out to be 9706, but this would not serve our purpose, which is to find a value in accord with experimental results. A large part of the energy of the powder is wasted in overcoming frictional resistances and in giving velocity to the charge itself; so that the empirical value of a is very much less than its value calculated as above. Actually the value 6857 f. s. suits our powder very well.

As for the value of $\frac{n-1}{2}$, this may be taken as $\frac{1}{12}$.

Since the other constant (b) is twice the travel to the point of maximum pressure, it must depend first of all upon the quickness of the powder, or, with any particular kind of powder, upon the dimensions of the grain. Then, as Sarrau has shown, it must be proportional to the initial air space, and, finally, it must be inversely proportional to some power of the chamber volume and also to some power of the projectile weight, since increase of either of these diminishes the distance to the point of maximum pressure.

Therefore, if s = chamber volume, δ = density of powder, Δ = density of loading, p = weight of projectile and β is a powder constant, we have

$$b=\beta\frac{s\left(1-\frac{\Delta}{\delta}\right)}{s^x p^y}.$$

And, taking $x=\frac{2}{3}$, $y=\frac{1}{3}$ for empirical values, and putting $\delta=1.56$, this becomes

$$b=\beta(1-.64\Delta)\left(\frac{s}{p}\right)^{\frac{1}{3}}.$$

To get the value of the pressure we differentiate the velocity formula, thus getting the acceleration of the projectile, and this, multiplied by the mass of the projectile and divided by the cross-sectional area of the bore (ω), gives the *effective* pressure per unit area on the base of the shell.

$$v=\frac{au}{b+u},$$

$$\frac{dv}{dt}=\frac{ab}{(b+u)^2}\frac{du}{dt}=\frac{abv}{(b+u)^2}=\frac{a^2bu}{(b+u)^3},$$

$$P=\frac{p}{g\omega}\frac{dv}{dt}=\frac{pa^2b}{g\omega}\frac{u}{(b+u)^3}.$$

And the maximum pressure is found by putting $u=\frac{b}{2}$ in this, thus getting

$$P_{max}=\frac{4}{27}\frac{p}{g\omega}\frac{a^2}{b}.$$

To recapitulate, the Le Duc formulæ, in our units, are as follows:

$$a=\alpha\left(\frac{\varpi}{p}\right)^{\frac{1}{4}}\Delta^{\frac{1}{12}}. \tag{1}$$

$$b=\beta(1-.64\Delta)\left(\frac{s}{p}\right)^{\frac{1}{3}}. \tag{2}$$

$$v=\frac{au}{b+u}. \tag{3}$$

$$P=\frac{p}{g}\,\frac{a^2b}{\omega}\,\frac{u}{(b+u)^3}. \tag{4}$$

$$P_{max}=\frac{4}{27}\,\frac{p}{g\omega}\cdot\frac{a^2}{b}. \tag{5}$$

In all of which

ϖ = weight of charge in pounds.

p = weight of projectile in pounds.

Δ = density of loading.

s = chamber volume in cubic inches.

α = a constant whose value depends only on the chemical characteristics of the powder and may be taken as 6857 for the present U. S. Navy powder.

β = a constant whose value (for any given kind of powder) depends only on the form and dimensions of the grain.

v = velocity of projectile in f. s.

u = travel of projectile in bore of gun in feet.

ω = cross-section of bore in square inches.

g = acceleration of gravity in f. s. s.

P = effective pressure on base of projectile in pounds per square inch.

P_{max} = maximum value of P.

The commonest use of these formulæ is in the case where the velocity given by a certain charge in a given gun has been measured. Knowing ϖ, p, Δ and α, the value of a is calculated from (1). Then, knowing the value of v corresponding to the total travel in the bore, b is found from (3), and after that the values of v and P at any point can be calculated from (4) and the maximum value of P from (5). Furthermore, b having been found, β can be calculated from (2) and then new values of a and b can be found corresponding to any desired values of ϖ, p and Δ, and the velocities and pressures given under the new conditions found from (3), (4) and (5).

The diagrams show space-velocity and space-pressure curves in the 50-caliber 12-inch gun ($\varpi = 328$, $p = 870$, $v = 2950$ f. s. for $u = 42$ feet) calculated in this manner. The value of b is 15.2 feet and the maximum pressure 16.96 tons.

It must be remembered that the pressures thus calculated are the *effective* pressures, so that to get the actual gas pressure at the base of the projectile it is necessary to add from 1 to 2 tons per square inch during the first part of the travel and from .5 to 1 ton per square inch near the muzzle. Moreover, the pressure at the bottom of the chamber, where the gauges measure it, is supposed to be from 15% to 20% greater than that at the base of the projectile.

The following results will show how accurately these formulæ give muzzle velocities for different conditions of loading in one gun and for different lengths of gun using the same charge:

6-inch Brown Wire-wound gun (using a value of β calculated from one round):

$\tilde{\omega}$	V meas.	V cal.
32.60	1905	1812
49.00	2500	2466
58.33	2865	2847
64.33	3100	3101
65.33	3140	3144
66.33	3180	3187
67.33	3220	3230
68.33	3260	3274
68.83	3286	3296

Three 6-inch guns of different lengths (using β as calculated from one gun):

	$\tilde{\omega}$	V meas.	V cal.
30-caliber gun	24.3	2210	2209
35-caliber gun	24.3	2320	2318
40-caliber gun	24.3	2400	2403

Two 8-inch cut-off guns (using β calculated from a whole gun):

$\tilde{\omega}$	Gun with 74″ cut-off.		Gun with 128″ cut-off.	
	V meas.	V cal.	V meas.	V cal.
35.5	1605	1606	1404	1427
40.5	1752	1751	1538	1560
43.0	1827	1822	1609	1625
45.5	1897	1892	1683	1690
48.0	1967	1962	1758	1755

These foregoing figures prove that the formula gives the effect ive pressure near the muzzle with great accuracy, since otherwis it would not reproduce so closely the results obtained with dif ferent lengths of bore. To show how calculated maximum pres sures compare with gauge pressures the following example wi suffice:

6-inch, 40-caliber gun:

ω	V	β (cal.)	P_{max} (for β=2.41) tons	P (gauge) tons
22.5	2395	2.396	15.7	17.5
24.0	2498	2.409	17.4	19.6
24.4	2516	2.459	17.9	20.1
27.0	2694	2.476	21.2	24.5
29.0	2848	2.396	24.7	26.3
30.2	2940	2.346	26.0	29.0
		2.41 mean value		

When we come to the crucial test, however, and try to ascer tain the results that a certain powder will give in a gun by usin the value of β calculated from the results obtained in another gu (of different caliber), we do not meet with complete success, a the following examples will show.

10-inch, 30-caliber and 13-inch, 35-caliber guns (using β cal culated from results given by same powder in an 8-inch, 45-calibe gun):

10" gun.			13" gun.		
ω	V meas.	V cal.	ω	V meas.	V cal
80	1656	1655	180	1911	185[illegible]
95	1925	1857	190	1988	192[illegible]
99	1986	1910	200	2078	198[illegible]
109	2149	2041			

Again, the mean value of β calculated from five rounds (using different weights of charge) in the 12-inch 45-caliber gun was 5.98, while for the same powder in the 10-inch 40-caliber gun the mean value from the rounds (with different weights of charge) was 6.36.

However, while these results show the formula not to be per- fect, it may at least be said to give fairly accurate results in even the worst cases, and its simplicity certainly commends it greatly

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POTENCY OF NAVAL BIOGRAPHIES.

By EDGAR STANTON MACLAY, A. M.

History written exclusively from official records is about as eresting as a tree without foliage; and the mind that is con- ed to merely professional reading must develop a correspond- curtailment of its attractiveness. It must be within the easy ollection of every man of education that some of the books he s read proved to be excessively dry, in sharp contrast to others it commanded attention from start to finish. And, likewise, we all men of learning and mark whom we have met who seemed be almost repellent while others had developed a charming and aring personality.

Indeed, there have been conspicuous instances of literary works which the author expended the best energy of his life (and which conscientious and painstaking research had been made) iich failed largely through lack of "attractiveness"; and we can name men who devoted themselves, perhaps too faithfully, their several vocations, who failed because their labors were t placed before their fellows in an interesting form. In short, is a formula that enforces acceptance more and more every ay, that "intrinsic value is appreciated by the public according the degree of human interest infused in it." The sphere of itrinsic value is enlarged in proportion to the circle of people vho can be interested in it. A tree, even when shorn of its foliage ias intrinsic value, but when it develops leaves, blossoms and ruit, its value is greatly enhanced. And so a man may be an cknowledged expert in his trade or profession, but the value of is knowledge is multiplied in the ratio in which he makes it iteresting not only to himself, but to others.

In no instance is this formula more strikingly illustrated than the career of our own navy. No sea force in the world has had nore commendable record (taken as a whole) than that of the

United States. Its history has been supremely interesting, often spectacular and, on occasions, dramatic. And yet, were these remarkable exploits written solely from official documents, they would be almost entirely deprived of their absorbing interest and thrilling episodes. It has been the naval biography, the narratives of eye-witnesses and the accounts of those indirectly, yet vitally, associated that give these official records their fructifying attractiveness.

In almost every instance the reports of our early commanding officers in sea fights have been noted for their modesty, brevity and meagerness of detail. In the Revolution many of these reports were made verbally so that their exact form is lost. To many of those rugged, hardy sons of the sea (to whom we are indebted for some of the most creditable victories in our history) literary work of any kind was a distasteful drudgery. We can the better understand this when we remember the lack of accommodation for such work aboard ship and that the implements for writing in those days were in a crude and decidedly cumbersome stage of development. It was a time when ashes from the ship's galley (the only fire maintained aboard) took the place of the modern blotting paper. In fact, with many privateersmen (who, toward the close of that struggle, formed the only considerable sea force we had) writing was a neglected art and in some instances never acquired. In view of these facts it is not strange that these early official reports were scant in documentary detail.

One of the most brilliant naval victories fought under the American flag (a victory that, at the time caused the British public great distress) was officially reported by Oliver Hazard Perry with scarcely more than "We have met the enemy and they are ours—two ships, two brigs one schooner and one sloop," his supplementary reports being largely devoid of material most interesting to the public. Were it not for the biographies of those taking part in the battle of Lake Erie and for the records left by those intimate with the subject, one of the most glorious achievements of Americans on water would have remained almost a blank. Thomas Macdonough's report of his equally momentous victory was similarly brief:

> The Almighty has been pleased to grant us a signal victory on Lake Champlain in the capture of one frigate, one brig and two sloops—of-war of the enemy.

Nearly all the official reports of our naval commanders in this second war with Great Britain are a scanty recital of merely the main data. Had it not been for that most valuable and interesting biography written by David Porter, much of the romance of the *Essex's* two-years' cruise in the Pacific would have been lost. It was left to the biographies of Porter, Farragut (who served as a midshipman in the frigate) and others to round out the full glory of that remarkable achievement.

During the Civil War the official reports of our naval commanders (owing to new regulations) were more replete; but, even then, it was left to the charming personal narratives of Foxhall Alexander Parker, Thomas Holdup Stevens, James Edward Jouett and other participants, to bring out the dazzling brilliancy of Farragut's fight in Mobile Bay. Other naval actions in that internecine strife would have failed of proper appreciation by the public had it not been for side-lights thrown on them by contemporaneous writers, surviving participants, newspaper correspondents and other witnesses.

Many of the most cherished mottoes in American folk-lore have been preserved solely through the medium of biographies, private diaries and paralleling narratives. It was John Paul Jones who inscribed in his journal "I have not yet begun to fight." It was from the testimony of by-standers that we learn of James Lawrence's immortal words "Don't give up the ship"—a motto that hovered over Perry's flagship on Lake Erie and piloted American naval prowess to one of its greatest victories. It was through a personal narrative that we learned of Farragut's vehement "Damn the torpedoes" at the time of the Civil War, while Dewey's "You may fire when you are ready, Gridley," at Manila, and Philip's "Don't cheer men, those poor devils are dying," at Santiago de Cuba in the Spanish War also are recorded in personal narratives.

Possibly the most striking example of the potency of biography is had in the incomplete perspective that is found in the history of our maritime operations in the Revolution. In all the popular accounts of those stirring activities the exploits of John Paul Jones dominate—largely because he wrote such an interesting and complete account of the part he took in securing American independence. It is far from the purpose of the writer of this article to in the least disparage the value or brilliancy of the

:rvices rendered by this great commander. His career was e: ·aordinary and merits all the praise that is given to it.

But there were other naval officers in the Revolution who cploits fairly rival some of those of Jones and there were oth aritime ventures entered upon which compare favorably wi .s greatest achievement—but which are not so well known t story because those participating did not preserve their per ›nal accounts of these operations. Jones not only was one of th ost extraordinary naval officers of his day, but he possessed a :erary gift equally remarkable. It is doubtful if there was any ›mmanding officer of that period as cultivated in the art of tters as John Paul Jones. Indeed, it might well be discussed hether or not his triumphs in biography did not fairly rival his :ploits in war. Considering the neglect, and even contempt ir o many cases, with which the art of writing was held by most the burly "sea-dogs" of that day, we cannot too much admire ›nes's success in what must have been almost insurmountable fficulties in acquiring a facility in expressing thought on paper. Jones's letters to Lady Selkirk, when he returned the family ate taken from Earl Selkirk's country seat by some of the *Ran r's* men, compare favorably with the best types of the somewhat ›rid style affected by gentlemen in those days. Jones's narra ʳes of the part he took in hoisting "the first American" flag ı a regularly commissioned Yankee war craft, his story of the pedition to the Bahamas. the action with the *Glasgow,* his ad ntures in the *Providence,* his remarkable cruise in the *Range* d, most important of all, his extraordinary action with the *'rapis,* are most complete and satisfactory: in short, an idea count of what naval officers ought to give of the part they take events of national interest.

With such reliable and valuable information at hand, it is no ɔnder that historians have given Jones a dominating place in e maritime operations of the Revolution; more especially when e remember that scarcely is there one of the other American ıval officers of this period who preserved in writing the part h his ship took in our struggle for independence on the high seas ›nes, without question, performed deeds of valor (ay, a serie them) which justly entitle him to the prominence he enjoys e naval campaigns of the Revolution: but there were oth :eds of valor and other expeditions fairly rivalling his in tl

same period which are scarcely known because there have been no biographical or, in fact, any record made of them save the merest mention in the current literature of the day.

Jones's descent on the town of Whitehaven, England, was bold and, in view of the burning of the American towns of Norfolk and Falmouth (now Portland) and other places by the British, justifiable. But equally bold and perhaps even more successful in the attainment of its main objective, was the capture of Hamilton, the principal town in Bermuda, with its fort by a party of American sailors and the seizure and transportation to Philadelphia of its store of powder and military supplies at the outbreak of the Revolution—just at a time when our land forces most needed arms and ammunition. In his escape from pursuing British war ships (while in command of the *Providence*) Jones displayed a seamanship that was seldom equalled and never surpassed in his day. Extraordinary skill in seamanship also was displayed by John Barry and some other naval officers in our navy in this war which called forth praise even from the enemy.

There is no page in naval history more magnificent than that which deals with Jones's superb audacity in attacking the formidable *Serapis* within sight of the English coast, while in command of a motley crew in a broken down merchant ship. Yet, had adequate biographies or personal narratives been preserved to us we would find an equal to Jones's supreme daring in the attack on the British 64-gun ship-of-the-line *Yarmouth*, Captain Nicholas Vincent, by the American 32-gun frigate *Randolph*, Captain Nicholas Biddle, just east of Barbadoes, March 7, 1778, more than a year before Jones's attack on the *Serapis*.

On sighting the *Yarmouth*, Biddle signaled the four armed vessels, cruising in his company, to make all sail in escape while he covered their retreat by boldly advancing to attack the huge line of battleship single-handed. Had not Biddle's heroic sacrifice been fully confirmed by the English themselves, question might be raised as to its accuracy in some details—on account of their extraordinary nature. But British records have it as follows:

On the 7th of March, at 5 a. m., the 64-gun ship *Yarmouth*, Captain Nicholas Vincent, cruising eastward of Barbadoes, got in sight of a squadron of six sails, consisting of two ships, three brigs and a schooner. The *Yarmouth* made sail to close on the strangers and at 9 a. m. was near enough to hail the largest, which proved to be the American 32-gun

frigate *Randolph,* Captain Nicholas Biddle. The *Randolph* immediately hoisted her colors and fired a broadside at the *Yarmouth,* which being returned, a running fight of an hour's duration ensued, when the *Randolph* blew up. The *Yarmouth* being to windward, fortunately escaped being involved in the catastrophe, but several pieces of the burning wreck fell on her decks. An American ensign, rolled up, was blown upon the *Yarmouth's* forecastle not singed. The temerity of Captain Biddle in thus engaging a ship so much superior to his own deserved a better fate. . . . On the 12th the *Yarmouth* fell in with a piece of wreck of the *Randolph* on which were found four men, part of the crew of the ill starred ship. The poor fellows had been on the wreck four days and had subsisted on rain water which had been imbibed by a piece of blanket which they had picked up. With these exceptions, all hands perished.

What a chapter of mortal heroism, that will never be recorded is contained in these few words.

For sixty agonizing minutes the 315 men in the American frigate maintained their fight against hopeless odds—and only four came out alive. A famous poem was written on the "Charge of the Six Hundred" at Balaklava, more than half of whom survived that desperate attack. What could not be written of the 315 men who, with calm deliberation, advanced to certain death and for an hour struggled against a pitiless fate—and it was the merest chance that 98 instead of 100 per cent of their numbers perished —just to save their consorts from capture.

The other vessels of the squadron were pursued, but owing to the delay caused by Biddle's sacrifice the *Yarmouth* was unable to overtake them. It is evident that the four survivors did not commit their experiences or that of their dead shipmates to paper, else what deeds of heroism would have been left to us: what descriptions of slaughtered gun crews which were promptly replaced by those still alive, what revolting scenes must have been witnessed in the cock-pit, what returns to duty after leaving the surgeon's table, what shouts of encouragements Biddle and his officers gave to the men as they struggled with the heavy cannon with rapidly decreasing numbers. Regrettable, indeed, it is that these four survivors did not leave some record of this scene of supreme heroism.

But even more audacious than his attack on the Baltic fleet was Jones's plan to capture Liverpool, England. His purpose was to fit out a squadron in a French port, take aboard 650 of the king's dragoons and soldiers under the command of Lafayette, make directly for the Mersey and after having laid that great shipping

center in ashes or under ransom, return to France before a sufficient force could be collected to intercept him. Before this plan could be perfected, Lafayette was ordered to command one of the king's regiments in another service. Thus we see, that by means of Jones's invaluable diary, we learn even of projected enterprises.

But while the attempt on Liverpool fell through there was an American expedition undertaken on a much larger scale which, although resulting disastrously, was most commendable in its effort and which undoubtedly brought out many acts of individual heroism which have been lost to us because of the failure of those participating to record them. This expedition was that against the fortifications the British had erected near the mouth of the Penobscot with a view to establishing a naval base nearer to the rebelling colonists. The New Englanders sent an expedition of 1500 soldiers under General Solomon Lovell in thirteen privateers and transports against this place under the convoy of three Continental cruisers which were commanded by Captain Dudley Saltonstall. The expedition arrived off the fortification on July 25, 1779, but, owing to the formidable character of the works, could make little headway. On August 13 a powerful British fleet, under Sir George Collier, appeared and dispersed the Americans.

Although the general outcome of this enterprise was unfortunate for the Americans there were many heroic episodes connected with it which reflect the highest credit on our colors. These interesting details have been lost because they were not preserved in writing or because those written records have become scattered and difficult of access.

And there are other instances of conspicuous service rendered by our maritime forces of the Revolution which must forever remain a blank because of meagerness of records. Nowhere does the potency of naval biography appear with greater force than in the case of Moses Brown who commanded the heavily armed privateer *General Arnold* which, in 1779, fought two severe actions off the eastern Atlantic of which there is not even the merest reference in our naval histories or official records. At that time many of our privateers were called upon for government service and, in fact, were the only considerable sea force we then had. As a large number of them were commanded by

navy officers or by men who afterward entered the regular s vice, they can properly be cited as an integral part of the navy the Revolution.

In the first action, that with the English letter of marq *Gregson* of Liverpool carrying 20 guns and 180 men, the enen had 18 killed and a proportionate number wounded after a de perate action of "two hours and fifteen minutes." The secon battle was with the British 16-gun privateer *Nanny* which, a though of inferior force, made a magnificent fight—actually sinl ing alongside the *General Arnold*, her people scarcely having tim to man their boats.

These sea fights have been preserved to history solely throug naval biography. Brown's autobiography was not discovere until many years after his death. It was found at a distant poi in Maine and is now preserved by a historical society. Brown account is fully corroborated by the journal of Thomas Gree (who was sailing-master in the *General Arnold*) and by th "Narrative of Ignatius Webber," a prize-master in the same shi These biographical records have recently been unearthed an together with the official report of the English commander of th *Nanny*, form one of the completest and most satisfactory accoun of any sea battle fought in the Revolution.

That there were some sea fights in the Revolution of whic every official record is lost is shown in the case of (presumably the Massachusetts cruiser *Mars*, Captain Simeon Samson. Th only record of this action is found in the head-stone of a grav in a private burial ground in Rochester Center, in the sout western corner of Plymouth County, Mass. It reads as follows

> Lieut. Nathan Haskell, fell in an engagement in latitude 47 & 18 N. c the coast of France ye 9th Sept. 1780, in the 20th Year of his age.

Persistent research reveals the fact that this Haskell was "lieutenant of marines, ship *Mars*, commanded by Capt. Simeo Samson; list of officers of State navy; commissioned July 2 1780." This record was found in the Massachusetts archives c the Revolution and another entry in the same records refers t Haskell as "lieutenant of marines, ship *Mars*, commanded b Capt. Simeon Samson; engaged June 5, 1780, discharged Se tember 9, 1780 [the date of the battle]; served three mont four days. Reported entitled to share in brig *Tyrall*, if made prize, also reported deceased. Roll dated Boston." There can

no doubt that the *Mars*, commanded by Simeon Samson, had an action off the port of Nantes, France, on September 9, 1780, but all details seem to have been irrevocably lost.

Haskell came from a distinguished New England family, one of his ancestors being Roger Haskell, of Salem, whose son, Mark, came to Rochester in 1692 to avoid serving on a jury in a witch-craft trial. Lieutenant Haskell's brother, Elnathan, born September 4, 1755, was a major of artillery in the Continental Army during the Revolution and, while an aide to Washington, had occasion to visit Mount Vernon—sometimes remaining there several days. Major Haskell's face appears in Trumbull's painting of "Burgoyne's Surrender," which is preserved in the Capitol at Washington.

We have another instance of a sea fight in the Revolution which recently has been rescued from oblivion through persistent research—the action being especially valuable to the student of naval warfare on account of its being, probably, the first instance in this war in which the new gun, known as the "carronade," was used in real service. Hitherto armed craft had been supplied with the long-range gun, but about this time a gun was manufactured at Carron, Scotland, which, although not having such a long range, had far greater "smashing power," and in this action "threw the privateer's people into the utmost astonishment." The Scotchmen's interest in this first actual test of their new gun is apparent.

This action was between the American privateer *Skyrocket* and the Scotch letter of marque *Sharp*, commanded by Archibald Bogg. The only official record we have of the *Skyrocket* is in Emmons's Statistical History of our navy which merely notes the craft as a "brig, 16 guns, 120 men, commanded by Burke, commissioned from Massachusetts in 1779; probably overrated in guns and men." Nowhere does it appear that this vessel engaged in a severe action in the enemy's home waters in March, 1779.

Through the kind assistance of Prof. Alexander Anderson, of the University of Edinburgh, Scotland, and Dr. Hew Morrison, librarian of the Edinburgh Public Library, the writer recently was able to secure a copy of a letter from Captain Bogg describing the fight and also a comment on the letter which was printed in an Edinburgh newspaper under date of April 16, 1779. As it is entirely new material bearing on the history of our maritime

forces in the Revolution it is given in full so that it may be pr served in the INSTITUTE PROCEEDINGS.

It appears that the *Sharp* was owned in Glasgow and wa bound on a voyage to Jamaica, but before clearing the Irish coas she fell in with the Yankee privateersman. The latter is dated "off the harbour of Corke, the 27th March, 1779," and it reads as follows:

On the 17th, being a little to the westward of Tulker, a cutter privateer passed the *Sharp*, she dogged us till the 18th at night when she attempted to board us. I hailed her with a broadside, which made her crew cry out in a most horrible manner, but did not understand what was said. She immediately sheered off and I saw no more of her.

On the 24th, standing off from the Old Head of Kinsale [County Cork Ireland], made a sail ahead, steering to the westward, which at 2 p. m weathered the *Sharp* at some distance, till she got upon her quarter, the wore ship and crowding all sail, came up with us a little after four, an hailed without showing any colors on either side. I hailed her, "from whence"? was answered from America; upon which I hoisted our colo and gave her a broadside; she then displayed the thirteen stripes an returned it smartly. The *Sharp* gave battle four glasses [two hours when the privateer thought proper to sheer off, crowding all sail. I gav chase, but was soon left astern. She was ship-rigged, mounting twent carriage guns, swivels and small arms.

The *Sharp* had one man, David M'Ewan, killed, not another touche and all in high spirits. The sails and rigging being much cut, I made sa for Corke with an intention to rest there; but, when off the harbor, I fe in with the *Blagrove, Mermaid, Hope, Jamaica,* and some others, boun to the West Indies, with whom I mean to proceed on my voyage, bein happy in having joined them.

The news item continues:

On receipt of the above, the underwriters at Glasgow, on ship and carg subscribed a genteel sum to be presented to Captain Bogg for his spirite behavior, in beating off so much superior a force, and also to give a present to the family of the man killed. The *Sharp* was armed with 1 carriage guns, six of them 12-pounder carronades, 6 swivels, and 25 men the *Betsey* [commanded by], M'Arthur, from Clyde to Oporto, is taken by the *Skyrocket* privateer. Capt. M'Arthur is arrived at Greenock, and reports that it was the *Skyrocket* that engaged the *Sharp* (he being a prisoner on board during the engagement), and that the weight of the *Sharp's* metal, together with the quickness of firing, particularly of the carronades (short guns of a new construction made at Carron) threw the privateer's people into the utmost astonishment, the first shot that was fired killing two men and cutting the sails and rigging in a terribl manner; and that the execution on board the privateer was such that the would have struck to the *Sharp*, had she been able to come up with ther

The *Leveller*, privateer, Capt. Campbell of Glasgow, was taken about the 28th ult. by the *Monsieur*, a frigate of 44 guns and 350 men. The *Leveller* sailed from Corke but two days before he was taken.

Thus we see from this record, brought before the American public more than a century and a quarter after its publication in Scotland, that an American armed ship which, in our records, is not credited with having accomplished anything in the cause of independence, at least took one prize (the *Betsey*), had a sanguinary action with the *Sharp* off the enemy's coast and rendered the master of the *Sharp* "happy in having joined" consorts on his voyage to the West Indies.

The *Monsieur* mentioned in this account as having captured the *Leveller*, undoubtedly was the French privateer of that name which shortly afterward joined the squadron under John Paul Jones. At least, we know that there was such a craft in these waters about that time. According to this account the *Leveller* was captured on February 28 and we know that on August 14 following Jones sailed from L'Orient, "this time accompanied by the French privateers *Monsieur* and *Granville*."

But a still broader illustration of the potency of biography and individual narrative is had in the uniform neglect with which the general histories of the United States treat the conspicuous services rendered by our sea forces not only in the cause of independence, but in the War of 1812. In reading these histories one is almost led to believe that the fighting on water, as compared with the operations on land, was inconsequential; yet a few salient facts will show that the maritime aspect of that struggle was most serious and, from the English point of view, quite as important as the land view.

In the course of the Revolution, America had 856 regularly equipped and commissioned armed vessels, mounting more than 14,000 cannon and manned by fully 12,000 splendidly officered, trained and accoutred men—men who were in no sense "raw militia," "poorly equipped, indifferently disciplined and inadequately armed," but the most skilful and experienced seamen in the world. These men captured nearly 800 British vessels and made prisoners of more than 16,000 English sailors—and it was right here that England was touched to the quick. She could replace her German mercenaries in America by hiring more, but she could not replace her seamen. Our land forces in the Revo-

lution made about 22,000 prisoners, but the capture of 16,00 British sailors by our sea forces struck a telling blow at tl English ministry.

Not only did our tars capture British sailors, but they ma prisoners of soldiers as well. The Massachusetts cruiser *L* captured 300 British troops with their colonel in two transpor the *Andrea Doria,* 200 Highlanders and 20 officers of the 71 Regiment, John Burroughs Hopkins's squadron of 24 army of cers, the privateer *Mars,* 214 Hessians, the privateer *Massach setts,* a company of dragoons, the privateer *Tyrannicide,* Hessian chasseurs, the privateer *Vengeance,* 1 colonel, 4 lie tenant-colonels and 3 majors, and the privateer *Warren,* 1 soldiers; making about 1000 of the enemy's troops taken by o sea forces.

But even more extraordinary than this was the manner which our marine carried the war into the enemy's count They swept British commerce from the West Indies and reduc some of the English settlements on those islands to the verge starvation. They hovered around the British isles, preventing t great fair at Chester, rendering it unsafe for peers of the rea to remain at their coast-side country seats, they threw Edinbur into alarm and actually set foot on English soil—arms in hand.

The astounding audacity of our sailors in carrying the w into the very chops of the English Channel is well illustrated the following letter written in 1778 by an Englishman:

An American privateer of 12 guns came into this road [Guern: Channel Islands] yesterday morning, tacked about on the firing of guns from the Castle, and just off the island took a large brig bound this port, which they have since carried into Cherbourg. She had impudence to send her boat in the dusk of the evening to a little isl off here called Jetto and unluckily carried off the lieutenant of Northl Independent Company here with the adjutant who were shooting rabl for their diversion. The brig they took is valued at seven thousa pounds.

Another Englishman, writing from Grenada in the West Indi April 18, 1777, says: "Everything continues excessively de here and we are happy if we can get anything for money reason of the quantity of vessels that are taken by Americ privateers. A fleet of vessels came from Ireland a few days ag From 60 vessels that departed from Ireland not above 25 arriv in this and neighboring islands, the others (it is thought) bei

all taken by the American privateers. God knows if this American war continues much longer we shall all die with hunger. There was a Guineaman that came from Africa with 450 negroes, some thousand weight of gold dust and a great many elephant teeth; the whole cargo being computed to be worth 20,000 pounds sterling, taken by an American privateer, a brig mounting 14 cannon, a few days ago." These valuable items of history have been preserved to us solely through biographical records.

The all-influential English merchant could hear of reverses to British troops in the far off wilds of America with complacency, because more troops could be sent out just so long as the stock of mercenaries lasted; but when it came to a direct blow at his pocket in the loss of his ships, cargoes and seamen he took a more serious view of the war. The British public could express impotent disapproval of the policy of burning American towns as a means of coercion, but this disapproval became really effective with the ministry when they realized that their own cities and towns were placed in the same danger.

In the second war with Great Britain we find an even greater disproportionment in favor of our sea forces. In that struggle we had 540 regularly commission-armed craft afloat, manned by more than 10,000 well-disciplined men, carrying 3449 heavy cannon and making prizes of no fewer than 1300 of the enemy's ships, together with 25,000 prisoners. Our land forces in this war did not make more than 6000 prisoners.

It was the vivid recollection of what American sea power had accomplished in the Revolution that made intelligent Englishmen hesitate to enter upon a second conflict with their transatlantic cousins. The *London Statesman* in 1812 ably summed up the situation as follows:

> Every one must recollect what they [American war craft] did in the latter part of the American war. The books at Lloyd's will recount it and the rate of assurances at that time will clearly prove what their diminutive strength was able to effect in the face of our navy and when nearly one hundred pennants were flying on their coast. Were we able to prevent their going in and out, or stop them from taking our trade and our store-ships, even in sight of our own garrisons? Besides, were they not in the English and Irish Channels picking up our homeward-bound trade, sending their prizes into French and Spanish ports, to the great terror and annoyance of our merchants and ship-owners.
>
> These are facts which can be traced to a period when America was in her infancy, without ships, without money, and at a time when our navy

was not much less in strength than at present. The Americans will found to be a different sort of enemy by sea than the French. T possess nautical knowledge with equal enterprise to ourselves. They be found attempting deeds which a Frenchman would never think and they will have all the ports of our enemy open in which they make good their retreat with their booty. In a predatory war on comme Great Britain would have more to lose than to gain because the An icans would retire within themselves, having everything they want supplies, and what foreign commerce they might have would be carı on in fast-sailing, armed vessels, which, as heretofore, would be able fight or run as best suited their force or inclination.

If it be true, then, that historians have systematically neglec reference to our sea forces in the Revolution and in the War 1812, the question naturally rises, "Why?" The answer n be had in the fact that operations on land were more fu "written up" in biographies, personal narratives and in t current publications of the day. Our land forces in these t wars (and, in fact, in every war) were, to an appreciable exte made up of men from all callings in life, including many pı fessional men, such as lawyers, physicians and even clergymen and last, but not the least, men engaged in literary vocatio such as publishing and periodical work. It is not to be deni that the plane of general education was higher in our land forc in these early days, than in the maritime branch. These army m wrote graphic letters to relatives and friends at home or to sor periodical, of the stirring events which they witnessed and which they shared. These descriptions, to a large extent fou their way in print and were thus preserved. Many of the arr men, on their return from the front, wrote biographies whi gave interesting and valuable information to historians.

With our sea forces it was much different. Instances of pr fessional men or men of broad education shipping before the ma were rare and their experiences on the "unkind sea" were distressing, in most instances, that they seem not to have car much about perpetuating them on paper. Even among th officers, although concededly the most skilful men in their pa ticular lines, who manned our ships there was a general negle of broader education. These blunt, rough-and-ready sea dog fell into the spirit of that day which was "every man shoul stick to his trade." They possessed nautical knowledge and mastery of seamanship which none could surpass. That wa their "trade." They were past masters of it and were conten

to relegate "fine letter writing" and "polite maneuvers," to "landlubbers" and "dancing masters."

Another element entering into the neglect of our sea forces by historians was the complete divorce of the naval service from politics, due, no doubt, largely to the fact that navy men often were compelled to be absent from their native land on protracted cruises and so lost their vote. A "war record" acquired on the high seas never was a very successful asset for political aspirations in the early days of the United States. On the other hand, such records in the army proved of the greatest value with the result that every little action or great action with which "the candidate" had been connected (even most remotely) has been systematically paraded and emblazoned before the people until they simply could not help being well informed (and possibly over informed) on the subject. At all events, we may assume, that every creditable feature of the action or actions in which "the candidate" was connected was thoroughly impressed on the public mind—in the "full abundance of its merits."

It is through these influences that every creditable action in which our land forces was engaged in the Revolution and in the War of 1812 has been impressed on the reading public at its fullest value while the several disasters and other reverses that befell our armies have been glossed over. With our sea forces the supporting machinery of "campaign literature" has been almost entirely lacking, which, together with the aforementioned distaste of Jack Tar for literary work in general, have left the brilliant exploits of our sea forces in these two wars sadly obscured so far as the reading public is concerned.

A concrete instance or so will illustrate this more forcibly. Scarcely was there a land battle or skirmish fought in the Revolution or in the War of 1812, in which the Americans were in any way bettered, which has not been perpetuated in memory by some geographical point or some State, municipal or village boundary being named after it. Yet where in the whole of the United States to-day is to be found "Bonhomme Richard Square?" England named its most conspicuous land mark "Trafalgar Square" and the *Bonhomme Richard-Serapis* fight was to America in 1779 what Trafalgar was to Great Britain a quarter of a century later. How many "Ranger" counties, towns, streets or parks are there in the United States to-day to commemorate one of the most audacious and successful sloop-of-war

actions in the world's history? Every educated American h heard of the battle of Lexington where fewer than ten of tl patriots were killed as opposed to none on the part of the enem of the capture of Stony Point with its garrison of 543 men; (Ticonderoga, manned by 50 Englishmen, and of the battle (Trenton, where Washington made 1000 prisoners; but how man have heard of the capture of 300 British soldiers by our littl cruiser *Lee,* of a company of dragoons by the privateer *Massa chusetts,* of 200 Highlanders by our *Andrea Doria,* and of 10 soldiers by the privateer *Warren?* And, of course, our educate public could not be expected to know of such brilliant fights a the *General Arnold* engaged in, or that took place on "Septem ber 9, 1780," and of other undoubted actions, when the ever-to be-lamented paucity of our naval biographies scarcely reveal the achievements even to the most diligent researcher.

In the light of these facts, there can be no question of the gre value and charm of naval biographies. They are the blossom the leaves and the fruit which make the tree of history not onl valuable, but attractive. From the nature of the case only th more important features of these personal narratives can be use in historical writings and the reader who would enjoy in th fullest degree the fascination and romance, the sunshine an shadow, the pathos and tragedy of the militant seaman must ex tend his perusal far beyond the pages of set records and delv in the scattered accounts of those who personally took part i shaping the glorious career of our sea power.

There is a charm, a revelation of character, an opening of th inner lives of great sea warriors in these autographical wor that cannot be found elsewhere. Possibly there was not a stricte disciplinarian in the Royal Navy at the time of the War of 181 than Philip Bowes Vere Broke. So stern was he that his me had come to believe that he was devoid of human emotion; yet when he fell unconscious from a desperate wound on the deck of the *Chesapeake,* covered with his own blood, his attendants, on loosening his clothing, found a small blue silk case suspended around his neck. It contained a lock of his wife's hair. Only a few minutes before this, Broke was calling on his crew to "kill the men; kill the men!" while Lawrence (who had but recently taken a tender adieu of his young wife) was lying mortally wounded, only a few feet away from Broke, urging his men to "Peacock them; Peacock them!"

On the night before the great battle of Mobile Bay, Farragut escended into the privacy of his cabin and wrote to his wife: I am going into Mobile in the morning if God is my leader, as hope he is, and in him I place my trust. If he thinks it is the lace for me to die, I am ready to submit to his will. God bless nd preserve you if anything should happen to me." On the same ight Chief Engineer John Faron, of the monitor *Tecumseh*, reived a letter from his young wife in New York. Early in the reat battle that took place on the following day the *Tecumseh* as sunk by a torpedo, carrying down with her 93 of her 114 en. When divers examined the wreck a week later they found aron standing with one hand grasping the revolving bar of the urret engine and in the other this letter which his sightless yes still seemed to be reading.

Such incidents as these, which are to be found only in personal arratives, serve to relieve war of some of its horrors and to show hat men trained to take the lives of their fellows have fully as uch of the human side in their natures as any other class. Such cidents bring the militant seamen in closer touch with his ther on shore.

It is in the perusal of these personal narratives that we find me of the most thrilling episodes of sea life. Early in 1805 hr ship *America* (afterward famous as a privateer in the War f 1812) visited Mocha in the Red Sea and we get some idea of he dangers to navigators, peculiar to those days, from the records ft by Benjamin Crowninshield, Jr., who commanded the ship. Inder date of January 21 he writes:

Completed our lading at this place which consisted of 2291 bags of offee, a quantity of gum-arabic, hides, goat skins and sienna. At 8 a. m. ood for the Abyssinian shore, having on board Mr. Pringle, the English onsul, a passenger to Aden.

Jan. 31st. Anchored abreast the Back Bay at Aden.

Feb. 7th. Stood to sea; anchored in Macalla Roads in 13 fathoms within istol shot of the shore. Here we learned that Mr. Pringle had taken passage for England at Aden in the Alert, a very fine ship from Calcutta; and that the Arabs [sailors] has risen upon her, had murdered the captain and fifteen men and had carried the ship into Calcutta.

Feb. 21st. At 6 p. m. an Arab, who is going passenger with us to the Isle of Bourbon came off from the shore. He advises us to put to sea immediately as the Dolah would fire upon us this night; his excuse being that we had furnished Mr. Pringle with cannon and powder. At 8 p. m. weighed anchor with as little noise as possible and went to sea.

Forty-four years after this we find, in a private record, t Calcutta is again mentioned in one of the great tragedies of sea. In his diary, kept during his cruise around the world 1857-'59, the late Rear-Admiral Stephen Decatur Trenchard preserved a graphic account of the burning of the British tr ship *Sarah Sands,* an iron screw steamer bound for Calcutta, h ing on board 400 soldiers besides a number of women and childr Trenchard's account, which is taken from an eye witness, is follows:

On Wednesday, the 11th inst., one of the most fearful experiences fire ever experienced by man broke out in the after-hold of the ship 4.15 p. m. I was in my cabin dressing for dinner when I heard consid able bustle outside and, on going into the saloon saw smoke issuing fr one of the cabins on the port side. The fearful reality then flashed up me that the ship was on fire. On my way to the deck I met Major Br who ordered the ammunition to be cleared out of the magazine, which w immediately attended to. The whole of the boats were ordered to lowered, the ladies were put into the port life-boats and they stood c from the ship. So sudden and rapid was this awful fire that those amon us who had their wives on board had not time to take leave of them, f all that is dear to the soldier must be sacrificed to the call of duty a his country's honor. I accordingly rushed into the magazine and superi tended the getting up of the powder, which was soon cleared out of t starboard side. But that portion on the port side could not be got out f some time, owing to the density of smoke and heat. However, after plentiful supply of water, volunteers came forward and brought up t ammunition excepting one barrel which was dropped by one of the me and could not be recovered. Several of the gallant fellows who volu teered for this dangerous duty were brought up senseless, but were imm diately succeeded by others, until the whole was removed.

At 6 p. m. three rafts were constructed as a last resource, should w not succeed in putting out the fire. At 7 p. m. the flames were seen issu ing from the quarter deck; pumps, buckets and every available article we put into requisition and worked most gallantly by the officers and me who combated the flames with utmost coolness. Too much praise cann be given to Major Brett, in command of the troops during this fearf disaster, for the calm and soldier-like demeanor he displayed under ou trying circumstances, being wholly supported by all on board. At 11 p. m a barrel of gunpowder, together with the ship's ammunition, exploded blowing out the stern quarter of the vessel. Several persons were knocke down by the concussion. I was standing with a brother officer in com mand of a party working the pumps and we were all thrown forward fo some distance and fell to the deck. This explosion caused a fearful an solemn pause of some seconds, when our brave and heroic adjutant san out, "All's right, lads, that will do us good and with God's help we wil soon get the fire under," and pumps and buckets were passed with fres vigor.

At this time the ship was in flames from the mainmast to the stern. At midnight the mizzenmast was one body of flames and in half an hour fell overboard with a fearful crash. It is due to the officers and that part of the crew who were on board to state that they did their duty manfully; but I regret that honesty compels me to say that a few of the ship's company deserted their vessel in a cowardly and disgraceful manner. At 1 a. m., on the 12th instant, the mainmast was observed to be on fire and it was with the utmost difficulty that the flames were arrested. The mainyard was set on fire by burning embers, but fortunately was put out by a party of soldiers and two seamen headed by the chief mate going aloft with wet blankets. Had it gone, nothing could have saved us. The decks were cut away, dividing the engine-room from the mainmast, which assisted materially in arresting the fire, as we were enabled to pour tons of water upon the iron bulkhead and coal bunkers. This, together with wet blankets, kept the fire from going beyond the first compartment. At two o'clock the flames were arrested and driven back inch by inch, but not until the whole of that part of the ship was destroyed from the engine-room to the stern. Our deliverance is one of the greatest miracles on record.

To convey an idea of this awful catastrophe is impossible. It may be imagined but never described. At four o'clock the danger appeared to be principally over and at half-past five the fire was completely out. About this time I went with a party of men to pump the water out of the fore part of the ship. The after-hold contained eighteen feet of water; a heavy sea was running and the ponderous iron water tanks were hurled from side to side, making a noise like the roar of cannon. At this time the sea was rushing in at the stern, where it had been damaged by the explosion. Then pumps were manned and buckets rigged and all hands went to work cheerfully to empty the ship, being apprehensive that we had only escaped the fire to be swallowed up in the mighty deep. No pen can describe our feelings the morning after the fire, having been saved from the awful death that stared us in the face and, as far as short-sighted mortals could see, were confronted by an equally horrible death.

Having time to reflect, I thought of the poor unfortunate women and children who had been exposed in an open boat all night, with scarcely any clothing save that of a blanket each, with a heavy sea on and the waves continually passing over the boat. My suspense at this moment was awful, but at six o'clock I was gratified with a sight of the boat and saw that all were alive. At eleven o'clock the ladies came on board and it was a joyful meeting.

To the biography of a Berkshire, Mass., lad who served in the famous American privateer *Prince de Neuchâtel* in 1814, we are indebted for an "inside" view of the then new British frigate *Leander* which, according to the *London Times* of that year, had been fitted out "on the exact lines" of the American 44-gun frigates and, with a picked crew under the gallant Sir George Collier, sailed from England with the expressed purpose of meet-

Prison," said a third, and many other names were given, each desirous of mentioning a place where we could be lodged in safety. "Castle William is the best place that will hold all in the country," returned the commander.

Suddenly altering his tone he burst upon one of the prisoners in his front with the force and unexpectedness of a rocket. "You are an Englishman and shall be hung for being taken in arms against your countrymen. You whelp. Who are you?" raising his voice as he proceeded till its height at the termination and breaking with the angry and overflowing spleen of the speaker either in earnest or well assumed effect.

This philippic and heinous charge was directed to a diminutive man who stood directly in front of the commodore. He wore a red-flannel shirt, woolen cap and tarry trousers—being all he had saved from the privateer—and was as unlike an Englishman as an egg is unlike a piece of chalk in its most angular form. He was at best but a scant pattern of nature's doings, both in height and breadth of beam. By trade he was a tailor and just out of his apprenticeship. When the commodore so suddenly turned upon him, the tailor shrank perceptibly, his eyes bulged out with fear and his head sank into his shoulders until not much was left to substantiate his birth and parentage. As soon as he could collect sufficient breath to make his voice audible—which he had been gasping to accomplish as long as it takes to narrate the circumstances from where the commodore's explosion ended—he said:

"My name is Nathan Slocum. I was born and always lived in the town of Boston, where my mother now is. I am a tailor by trade—ah—and never was from home before—ah—in my life sir."

The "ah" was delivered mechanically with a shaking fear at the dire threatenings of the rough old commodore; redoubling the gaspings at the termination of each sentence with a spasmodic stretching of the neck that made some believe he was thus early trying to accommodate his neck to the hanging he anticipated at the yard-arm above.

"You lie," shouted Sir George. "You are an Englishman as I can tell by your eye. It is no more than you deserve to string you up to the yard-arm and hang you for a traitor as you are—to warn others how to behave. But we will wait till we arrive in England where you shall get your deserts and where we will soon have all the Yankees in the country—every damned . . . . one of 'em." And the commodore moved off muttering: "We'll fix 'em. Take the whole of 'em. Keep 'em on bread and water for life, damn 'em."

The poor tailor stood petrified with a ghastly fear which was depicted upon his countenance. His frame shook as with an ague fit till he was brought to by some one slapping him upon his back and telling him to haul taut his eye backstays or he would pitch all forward.

The commodore with his suite continued his review, previous to prayers. He had gone through with all but the marines and had just begun with them when further ceremony was dispensed with for the day by a circumstance as ludicrous as it was unmilitary. The marines were drawn up in a line, lengthwise on the quarter deck, about sixty in number. They were without arms for the purpose of better balancing themselves to the roll of the frigate. I had for some time been watching them and was no little

engaged with their swayings to and fro in a body; I could not help thinking that at times it was impossible for them to keep their feet at the alternate slanting of the deck under them.

Just as the commodore was prepared for their inspection and was but a step from their front, a heavy sea struck the frigate at her upward roll causing her to lay over much more than usual. This threw the entire body of marines to the farther side of the deck from where their line was drawn up, taking with them such of the commodore's suite as happened to be in the direct course of this sweeping avalanche of red coats, blue trousers, feathered caps, pipe-clay and cross belts. All tumbled helter-skelter, pell-mell; officers, soldiers, sailors and boys, with as little regard to seniority as to precedence—the whole mass went crumbling together to the leeward and there to separate as best they could.

This put a stop to the further inspection for the day, nor did they attempt to dress the marines in the line again till the gale abated. Many were more or less hurt, three having to be carried below and placed under the surgeon's care. The commodore, not having advanced so far as to fall in with this swinging current of human bodies, held his footing with the aid of the ropes rove for the purpose. The scene was unique and truly laughable; so much so as to raise a broad yaw-haw among the prisoners and a smile upon the faces of such of the frigate's crew as dared to show they were pleased. Besides, I saw many of the petty officers busy with their handkerchiefs to their faces when it was plain they were not in search of their noses, as they were bobbing up and down with their heads and shoulders faster than the shaking wipers could follow.

The petrified tailor was interested for the first time since the commodore had so signally noticed him above his shipmates in adversity, by saying: "I would give the best sleeve in my coat if they had taken the old commodore along to leeward with them."

That the biographies and personal narratives of men who manned our war craft in the Revolution and in the War of 1812 have become scattered and scarce is a matter for serious reflection and regret. These individual records should be carefully gathered, properly edited and republished in permanent form. They are the real basis for historians to work on and each passing year makes the difficulty of collection greater.

That the charm and value of personal naval records are great cannot be doubted. They are indispensable to a comprehensible reading of our navy's history. We have full evidence of this in those remarkably interesting and enlightening articles, written by our officers (and by some enlisted men) who served in the war with Spain and which were published in magazines and newspapers. The official reports of these naval operations were full and complete, but their sphere of utility was vastly enlarged by the foliage and fruition of these personal narratives which made them vastly more attractive to the public.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE REVIVAL OF THE AMERICAN MERCHANT MARINE.[1]

By EDWARD ELLSBERG, Midshipman, 4th Class, U. S. N. A.

The American Merchant Marine of the present day exhibits a curious spectacle. While an immense amount of exports and imports annually passes through the harbors of this country, only nine per cent of them is carried in American bottoms. An American cargo carried in an American ship is the exception and not the rule. While in every other branch of business and manufacturing, the perseverance and enterprise of the United States have made her preeminent, in this branch, which was formerly one of our main resources, we have been admitting ourselves unable to compete with foreign nations.

At one time, ninety per cent of our commerce was carried in our own ships; our merchant tonnage was equal to that of Great Britain and exceeded that of every other nation; and the products of this country were spread over the entire globe. Shipbuilding was then the chief industry of the most prosperous section of the country; every effort was made by law to protect and encourage our foreign carrying trade; and by means of discriminating tonnage dues and other devices, American ships were more than enabled to hold their own, in spite of the competition of other nations.

This condition, however, lasted only to the beginning of the Civil War. The activities of the Confederate cruisers and privateers swept a large part of our commerce from the seas, and drove a larger part to the protection of foreign flags. At the conclusion of the war, shipbuilding was strangled by a heavy duty on all its materials. American capital, especially that of New England which formerly had been almost solely invested in shipping, now turned its attention to developing the natural

[1]The medal offered by The Admiral Trenchard Section, No. 73, Navy League of the United States, to Midshipmen of the 3d and 4th classes for the best essay on a topic either naval or patriotic in character, was awarded for this essay.

resources of the West, to building factories in the East, and to constructing a network of railroads across the continent. Under these conditions, American ships, without government aid or protection, were left to sink or swim, and were unable to hold their own against the more cheaply built and manned ships of other countries. At this time, the substitution of the steel steamer for the wooden sailing vessel placed our shipbuilders under a tremendous disadvantage, for as England then had the more accessible deposits of coal and iron, she was able to construct the new class of vessel more cheaply than we were, and so gathered to herself the greater part of the world's trade. For a short time, our sailing vessels had a slight advantage in the China trade, as they did not have to give up cargo space to coal, but the opening of the Suez Canal, which enabled steamers to recoal en route, gave the last blow to our struggling foreign shipping. Our present merchant fleet, as an aid to this country, has little value.

The revival of our merchant marine brings forward two questions: Are we now able to build and operate a merchant marine? and, Does our need of a merchant marine justify the labor necessary to bring it into existence?

The United States is at the present time able to build and operate a merchant marine, for the conditions which were instrumental in destroying our foreign tonnage, with one exception, no longer exist.

While it is still frequently asserted that we cannot build ships as cheaply as England can, on account of the higher cost of materials, Mr. Cramp, the head of Cramp's Shipbuilding Company of Philadelphia, said before a committee of Congress which was considering the question of removing the existing duties on shipbuilding materials,[1] "If our shipbuilders could be relieved from that [tariff], they could compete successfully with foreign builders." The tariff on materials entering into the construction of modern ships has been removed, but even this is unnecessary. Foreign steel is no longer cheaper than ours. We have developed the steel industry, until now we supply the world with American steel products. On account of their quality and lower price, American steel rails now find a market in England itself. We are able to manufacture steel here more cheaply than it can be done anywhere else in the world.

[1] Nation, 71:183.

American shipbuilders are certainly able to build modern vessels as cheaply as European builders, for in a recent competition for the building of two Argentine battleships, in which bids were received from English and German yards, the contracts for both vessels were secured by American builders.

Another cause of the decline of our marine, lack of capital, has also disappeared. The opportunities offered at home for the profitable investment of our surplus capital are becoming limited, and a large part of this capital will undoubtedly be invested in shipping if the necessary incentive is given.

There still remains, however, one obstacle in the path of the revival of American shipping. The cost of operating ships under foreign flags is undoubtedly less, and in order to offset this difference, something will have to be paid to shipowners. We have a tariff to protect our industries on shore, and it is but simple justice that some compensation be paid to shipowners to enable them to operate under the American flag. Some such bounty as this is also necessary in order to bring about the investment of capital in this new channel.

There are various methods proposed of raising and distributing these bounties. The one most frequently discussed is a direct ship subsidy. There are, however, too many objections to direct subsidies to permit their being used. Former direct subsidies resulted only in corruption and failure. The public is generally opposed to direct subsidies, and it is altogether unlikely that any such system could again be established in this country.

There is another method of providing these bounties, based on tonnage dues, which is feasible, though it has never received much publicity. The system first used by Congress to build up our marine, by laying discriminating tonnage dues upon shipping, fifty cents per ton upon foreign ships and six cents per ton upon American ships, was without doubt useful and helped to accomplish its purpose; but on account of existing treaties with foreign nations, we cannot now make use of this method without upsetting all of our commercial relations.

The proposed method differs from the original in that it lays a tax, say of fifty cents per ton, upon every ton of shipping, foreign or domestic, which enters our ports. As this is not discriminating between our own ships and those of foreign nations, no complaints can be made by foreign shipowners. As at the present time, but nine per cent of our commerce is carried in

American ships, the bulk of the money thus raised would be contributed by foreign ships. The fund thus raised would be distributed among our ships, a proper ratio being observed between sailing and steam vessels. The method of raising the fund would determine the proper amount to be given to each vessel, through the record of its payments into the fund.

This sum, raised without any drain on the public treasury and distributed among our vessels, would make it possible to operate profitably a merchant fleet sufficient for our needs. As over 6,000,000 tons of foreign shipping entered our seaports during 1909, the sum of $3,000,000 would be available for distribution—a sum more than sufficient to offset the lower cost of operating foreign ships.

This system would thus provide the stimulus necessary to enlarge our marine, and at the same time it would automatically prevent the building of unnecessary ships; for as the number of our ships increased, the proportion of the fund paid by foreign ships would decrease, and owing to the larger number of ships participating in the fund, the amount paid to each ship would decrease.

As the above facts show that the United States has the means necessary to build a merchant fleet, and the foregoing system provides a method of profitably operating such a fleet, the only question remaining is whether our need of a merchant marine is sufficiently pressing to employ the means necessary to bring about a revival of shipping.

The effects of leaving our carrying trade in the hands of others in this present age of production for a world market, are becoming felt. At this time, when American manufacturers must have foreign markets to take their surplus products, the value of a safe and efficient method of distributing those products is evident.

At the present time, American manufacturers are complaining of a falling off in the volume of our trade with foreign countries, more particularly in regard to that with China. From a total of $58,000,000 in 1905, our exports to China have decreased steadily year by year, until in 1910, they amounted to but $15,000,000. Various reasons have been assigned for this decrease. It cannot be the result of a decreased demand in China for foreign goods, for every year, more of these goods are imported into China, but they are coming from Germany and England instead of from the United States. The reason for this is obvious.

ner in price nor in quality are these goods superior to our own, England and Germany, taking advantage of their superior portation and distributing facilities, have been able not only crease their own trade but also to grasp the greater part of

As a result of permitting our exports to be delivered in gn vessels, we have lost our grip upon the trade, which other nations, possessing their own shipping systems, that naturally closely connected with their manufacturing in-ts, have been able to seize.

ır business relations with South America also show our need merchant marine. Our geographical situation makes us the al supplier of manufactured goods to these at present unde-ped countries, but here again our lack of shipping has placed t a disadvantage. Our export trade to South America is igible. In spite of our proximity, the bulk of manufactured ls imported into South America comes from Europe. As the from the United States to South America are few, while ines from Europe to South America are many, in its business political life, South America is closer to Europe than to us. ı the mail destined for certain South American ports must be sent to England, to be from there transmitted to its des-on in English ships.

second result of our lack of a marine is the annual loss to ountry of the enormous sum which is paid to foreign ship-rs for carrying our commerce. The sum of $100,000,000 in is annually shipped abroad to discharge this debt. An Amer-marine, by keeping this amount at home, would yearly add ly to the total wealth of the nation.

side the above-mentioned results of a lack of shipping, a factor has recently developed. As almost all the ships trad-ıt our ports are foreign-owned, the rates for freight are fixed de of this country, and the recent action of the federal gov-ıent in bringing suit against certain companies as monopolies estraint of trade, shows that even in the matter of freight s, American shippers cannot expect justice from foreign-ed ships.

is sometimes argued that as long as there are enough foreign s to carry our commerce we need none of our own and may loy our capital elsewhere. It is just as reasonable to argue t we should allow foreigners to own and operate our railroads, ich are no more necessary to the national well-being than ships,

and then to expect that they would be managed in the best ii terests of the American people. In order that this country ma secure its fair share of the foreign markets of the world, and th: our shippers may obtain reasonable freight rates for the carriag of our commerce, it is absolutely necessary that we maintain merchant marine of our own.

The foregoing are economic reasons for the revival of our me chant marine. But the military reasons for a revival are eve stronger. In regard to the national safety, previous history show our urgent need of shipping. During the Spanish war, the armie destined for the invasion of Cuba, at a distance of only a hundre miles, were badly hampered by the lack of suitable vessels fc transports. At the end of the war hundreds of soldiers whor an immediate return to the United States would have saved, die of disease in that unhealthy climate, because no vessels were avail able to return them to this country. On the contrary during th Boer war, Great Britain was able to maintain uninterrupted com munications, constantly sending troops and supplies to South Af rica, at a distance of five thousand miles.

During the globe-circling cruise of our fleet in 1908, we showe our entire dependence upon foreign auxiliaries, for all the collie which furnished the necessary supplies flew foreign flags. I time of peace, we may rely upon the ships of other nations fo this aid; but in time of war, when not one foreign auxilia could be obtained, our battle-fleet would lose the greater part o its fighting value, for our own merchant fleet is altogether too sma to fill this imperative need. It is indeed curious that we have th second largest navy in the world, while we have no mercha shipping worth the name.

For this last reason alone, the United States should have it own merchant marine. Even though we required a mercha fleet for no other purpose than as an aid to our navy, the existenc of the merchant marine would be justified, for the cost of sustain ing it would be nothing in comparison to the injuries which migh be inflicted upon us in time of war through our lack of such an auxiliary.

And therefore, since the United States is now able to build a merchant marine; since there is a method by which such a marine could be profitably operated; and, since the needs, both economic and military, of the United States require such a marine, we should take immediate steps to bring about the revival of ou once magnificent merchant fleet.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SIMPLIFIED ELASTIC STRENGTH OF GUNS.

By LIEUTENANT H. T. WINSTON, U. S. Navy.

PREFACE.

The object desired is to present to the beginner in simple language the underlying principles of the design of guns, so far as the elastic strength of the tubes of the gun is concerned.

First the elementary "stress" and "strain formulæ" are derived and explained. From these formulæ the "pressure formulæ" are derived, showing the limits of pressure at different tube surfaces for any gun.

Diagrams are used to aid in understanding the true meaning of these formulæ, which have been simplified in order to save work in the computations.

Professor Alger's "Elastic Strength," Commander Nulton's "Graphic Representation" and Lieut.-Col. Lissak's "Ordnance and Gunnery," supply the material, which is condensed and simplified.

CHAPTER I.

ELEMENTARY STRAIN FORMULÆ: LIMITS OF PRESSURE FOR SOLID GUN.

Construction of Naval Guns.

The principle of *initial tensions* is used in our navy. That is, the inner tubes are in a state of compression while the outer are in a state of extension, which is usually accomplished by heating the outer tubes, slipping them over the inner tubes and letting the outer, when they cool, compress the inside layers.

This, of course, causes a distortion or change of shape and any such change of shape is called the *strain of the metal*. It is generally measured in inches along one of three rectangular axes, the *change per inch of length* (in fractions of an inch) being called the *unit strain* along the axis considered.

The force causing a strain or the resistance of the metal (equal and opposite to the force) is called the *stress of the metal*. The *unit stress* will be taken as the stress *in tons per square inch* (1 ton = 2240 pounds).

Some of the smaller guns are, however, not built up, having instead a solid barrel, and this type being the simplest will be the first to be considered, after equations have been derived showing the relation between outside pressures on the metal and the resultant internal strains they cause.

Laws of Stress and Strain.

Letting p = stress in tons per square inch (unit stress).
e = strain in inches per inch of length (unit strain).
E = modulus of elasticity (= 13,000 for above units).

Then by Hooke's law, $E = \frac{p}{e}$, or $p = eE$.

Experimentally it has been found that a stress along a certain axis, having produced a certain strain, will produce along the other two rectangular axes strains approximately $\frac{1}{3}$ of the strain along the stress axis.

Consider a metal bar, Fig. 1, pressed in on all sides by uniformly distributed outside pressures. Let the axial (or resolved stresses) at any point, A, in a cross-section of the bar be p_x, p_y and p_z. Then the strains produced by each stress along its own axis are by Hooke's law $\frac{p_x}{E}$, $\frac{p_y}{E}$ and $\frac{p_z}{E}$. In addition, each stress produces along the other two axes $\frac{1}{3}$ the strain along its axis.

Hence, calling a strain (+) when extension occurs and (—) for compression.

$$* \text{Total} - e_x = \frac{p_x}{E} - \frac{p_y}{3E} - \frac{p_z}{3E}.$$

$$\text{Total} - e_y = \frac{p_y}{E} - \frac{p_x}{3E} - \frac{p_z}{3E}. \qquad (1)$$

$$\text{Total} - e_z = \frac{p_z}{E} - \frac{p_x}{3E} - \frac{p_y}{3E}.$$

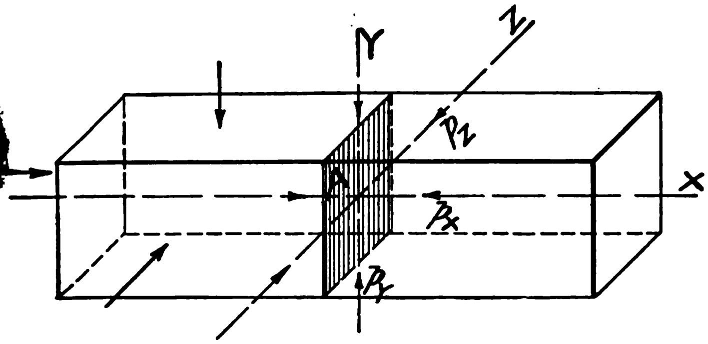


FIG. 1.

p_x, p_y p_z stresses along axes x, y and z.

It will be noticed from these formulæ that the total strain due to several stresses may be less than it would be if there were only one stress at any point A.

Hereafter it will be considered that the metal is not strained beyond its elastic limit at any point unless the strain due to all stresses combined is too great, even though one of these stresses alone would be accompanied by too great a strain.

* In order not to become confused by the + and — signs, it should be remembered that $\frac{p_x}{E}$ and the whole right-hand side of the equation represents compression, so consequently e_x is marked minus.

The Simple Cylinder (or Solid Gun).

Considering a simple cylinder, subject to internal and external pressures, and using the axes shown in Fig. 2, at any point A we see that the strain accompanying stress q will lengthen the cylinder and it would be pulled apart longitudinally by an excessive stress. Likewise, the stress p tends to crush in the metal radially, and t to split the cylinder open longitudinally. Of course the metal must not be strained beyond its elastic limit or a permanent set will occur.

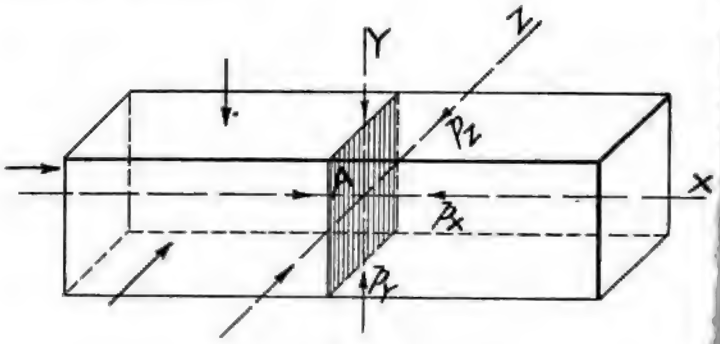


FIG. 1.

p_x, p_y and p_z stresses along axes x, y and z.

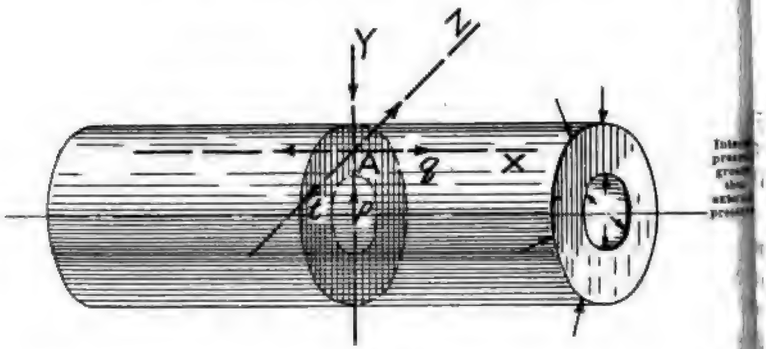


FIG. 2.

x axis parallel to bore.
y axis radial line from center.
z axis ($\perp$ to x and y) tangential line.

Stresses shown as with greater internal than external pressure (if otherwise arrows are reversed).

Since a gun is a cylinder with one end open, the powder pres-re has little chance to act in a longitudinal direction, so, of the ree stresses produced at A, q would be much the smallest. It found that by assuming $q=0$, equations may be derived involv-g t and p, which give as nearly correct results as may be ob-ined by any other method. Equations for the longitudinal stress e easily derived and may be found in several text books.

Elementary Strain Formulæ.

Let us assume that the cylinder in Fig. 2 is subjected to a uni-m internal pressure and a uniform external pressure, as would the case with an outside cylinder shrunk on this cylinder, and wder pressure in the bore just before the projectile leaves the izzle (assumption true enough for practical purposes).

Then from equation (1), noticing the changed signs due to inge in direction of stresses, we put $p_x=-q=0$, $p_y=p$, $p_z=-t$, $=-e_q$, $e_y=e_p$ and $e_z=-e_t$, and obtain

$$\text{axial strains at any point, } A\begin{cases} -e_q=\dfrac{1}{3E}(t-p), \\ -e_p=\dfrac{1}{E}\left(p+\dfrac{t}{3}\right), \\ e_t=\dfrac{1}{E}\left(t+\dfrac{p}{3}\right). \end{cases} \qquad (2)$$

Lamé's Laws.

The cylinder being of uniform cross-section and subject to a form pressure, the change in length will be the same for each t of length or $e_q=$constant; hence, from (2) $t-p=k$ (a con-nt).

Considering any section of the cylinder (see Fig. 3) of unit gth, subject to the unit external and internal pressures p_n and we see a stress t is produced, tending to split the section in halves. The pressure or force producing this stress t is $R_0-2p_nR_n$. Also the stress of the metal opposes this force , therefore, $2\int_{R_0}^{R_n} tdr=2p_0R_0-2p_nR_n$; since this is true the eral equation $\int tdr=-pr$ must be true; but the differential of r is $-pdr-rdp$.

$\therefore tdr = -pdr - rdp$ and $t = -p - r\dfrac{dp}{dr}$. From (3) $t = p + k$, so $p + k = -p - r\dfrac{dp}{dr}$ or $\dfrac{dp}{2p+k} = -\dfrac{dr}{r}$.

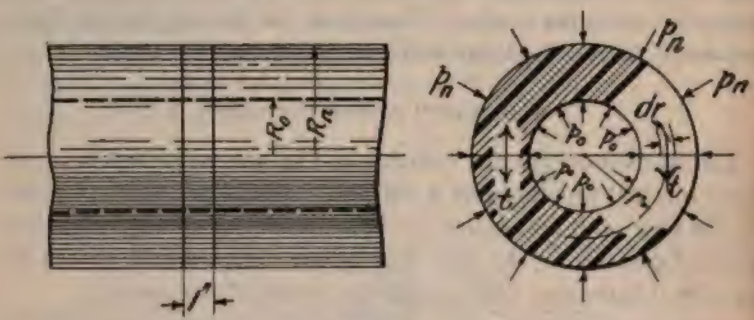


FIG. 3.

Unit external pressure p_n (tons per sq. in.).
Unit internal pressure p_o (tons per sq. in.).
Radii R_o and R_n—Section of unit length.

Integrating, $\displaystyle\int\frac{dp}{2p+k} = -\frac{dr}{r}$, $\therefore \tfrac{1}{2}\log(2p+k) = \log 1/r + \log k_1$ (k_1 being a constant of integration).

$\sqrt{2p+k} = \dfrac{k_1}{r}$, or $2p + k = \dfrac{k_1^2}{r^2}$, and since $k = t - p$,

$$p + t = \frac{k_1^2}{r^2}. \qquad (4)$$

$$t - p = k. \qquad (3)$$

These two equation (3) and (4), showing the relation betwee[n] t and p at any point whose radius is r (between R_o and R_n), ar[e] written as Lamé's Laws below.

1. At *any point* in a cylinder under fluid pressure the *sum* [of] *the circumferential tension and the radial pressure varies inverse[ly] as the square of the radius.*

2. The *difference* of the circumferential tension and the radi[al] pressure is a *constant for all points.*

Circumferential Extension and Radial Compression.

The stress t is often called the stress of circumferential extension and p the stress of radial compression.

Fig. 4 shows what will happen if p_0 produces a greater t than θ, the elastic limit of the metal for extension; also what occurs when the stress p exceeds ρ, the elastic limit for compression.

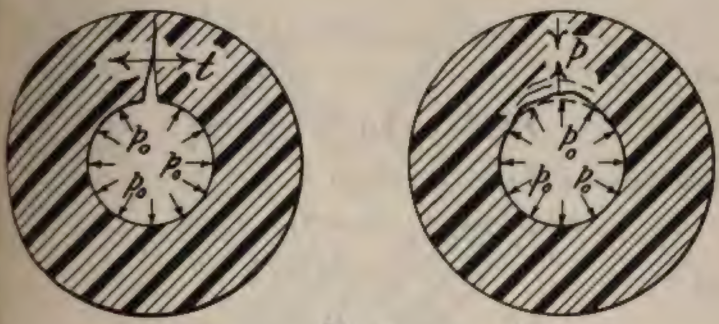


FIG. 4.

t is stress of circum. extension and is produced by p_0. p is stress of radial compression and is produced by p_0.

Showing how the metal of a cylinder may be ruptured in two ways by excessive internal or external pressure.

Derivation of Strain Formulæ.

At the *inner circumference* of any cylinder we may call the values of t, p and r, t_0, p_0 and R_0, and at the *outer circumference*, t_n, p_n and R_n.

Also from (3),

$$t_0 - p_0 = t_n - p_n = t - p = k. \qquad (5a)$$

From (4),

$$(t_0 + p_0)R_0^2 = (t_n + p_n)R_n^2 = (t + p)r^2 = k_1^2. \qquad (5b)$$

Then

$$t_n = t_0 - p_0 + p_n \text{ (from 5a), and } t_n = \frac{(t_0 + p_0)R_0^2}{R_n^2} - p_n \text{ (from 5b).}$$

Equating these values of t_n and transposing,

$$t_0(R_n^2 - R_0^2) = p_0R_0^2 - p_nR_n^2 + p_0R_n^2 - p_nR_n^2$$
$$= p_0(R_n^2 + R_0^2) - p_n(2R_n^2),$$

or

$$t_0=p_0\left(\frac{R_n^2+R_0^2}{R_n^2-R_0^2}\right)-p_n\frac{2R_n^2}{R_n^2-R_0^2}. \tag{6}$$

From (3)

$$t-p=t_0-p_0 \text{ and from (4) } t+p=(t_0+p_0)\frac{R_0^2}{r^2}.$$

Then

$$t=\tfrac{1}{2}\left\{t_0-p_0+(t_0+p_0)\frac{R_0^2}{r^2}\right\}$$

and

$$p=\tfrac{1}{2}\left\{(t_0+p_0)\frac{R_0^2}{r^2}-t_0+p_0\right\};$$

using the value of t_0 in (6) we get

$$t=\frac{p_0R_0^2-p_nR_n^2}{R_n^2-R_0^2}+\frac{R_0R_n^2(p_0-p_n)}{R_n^2-R_0^2}\cdot\frac{1}{r^2} \tag{7}$$

and

$$p=-\frac{p_0R_0^2-p_nR_n^2}{R_n^2-R_0^2}+\frac{R_0R_n^2(p_0-p_n)}{R_n^2-R_0^2}\cdot\frac{1}{r^2}. \tag{8}$$

Substituting these values of t and p in equation (2) we get th[e] *general and important fundamental strain formulæ* (9), (10) (11):

$$e_t=\frac{1}{E}\left[\frac{2}{3}\frac{p_0R_0^2-p_nR_n^2}{R_n^2-R_0^2}+\frac{4}{3}\frac{R_0^2R_n^2(p_0-p_n)}{R_n^2-R_0^2}\cdot\frac{1}{r^2}\right] \tag{9}$$

$$e_p=\frac{1}{E}\left[\frac{2}{3}\frac{p_0R_0^2-p_nR_n^2}{R_n^2-R_0^2}-\frac{4}{3}\frac{R_0^2R_n^2(p_0-p_n)}{R_n^2-R_0^2}\cdot\frac{1}{r^2}\right] \tag{10}$$

$$e_q=-\frac{1}{E}\left[\frac{2}{3}\frac{p_0R_0^2-p_nR_n^2}{R_n^2-R_0^2}\right]. \tag{11}$$

In order that the cylinder be not overstrained, *no one of th[e] strains* given by (9), (10), (11) must (at any point whose radiu[s] is r) exceed the elastic limit of the metal given by a testin[g] machine.

Elastic Limits of the Metal.

Call θ the *elastic limit for extension* and ρ the *elastic limit for compression,* both expressed in tons per square inch, as determined by a testing machine. The t, being a stress of extension, e_t must not exceed θ, and p, being a stress of compression, e_p must not exceed ρ.

A One-Cylinder Gun.

ie simplest gun, one with a solid barrel, is acted upon, when , internally by the powder pressure (p_0=tons per square) and outside by the atmospheric pressure (p_n), which may iken as zero, since p_o is very large compared to p_n (see 5).

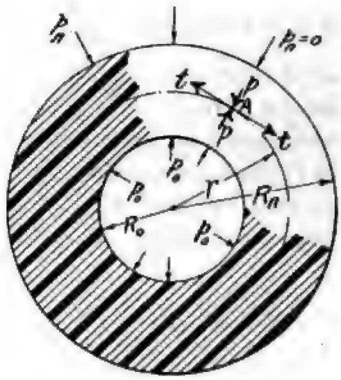


FIG. 5.

Section of Single Cylinder.

t any point, A, whose radius is r, the stresses are t and p. it is desired is a pressure formula, which will show the limit ,, *i. e.*, a p_0 which will produce a stress, t or p, equivalent to :lastic limit of the metal at its weakest point.

ressure Formulæ.—Letting p_n=0 in (9) we have at any point, hose radius is r,

$$t = Ee_t = \frac{2p_0R_0^2}{3(R_n^2 - R_0^2)}\left(1 + \frac{2R_n^2}{r^2}\right).$$

lently t is always (+), or a stress of tension, and is a maxi-n when $r = R_0$, its least value.

his shows that the *greatest stress* will be *at the inner surface* :akest point) and *this maximum stress must not exceed θ.*

Consequently, substituting θ for t and R_o for r, we get the pres-e formula

$$\textit{Maximum allowable value of } p_0 = \frac{3(R_n^2 - R_0^2)}{4R_n^2 + 2R_0^2} \cdot \theta. \qquad (12)$$

It should be noted that we have not considered the stress and its limit ρ. Putting in (10) $p_n=0$, then

$$p=Ee_p=\frac{2p_0R_0^2}{3(R_n^2-R_0^2)}\left(1-\frac{2R_n^2}{r^2}\right).$$

Evidently p is always (—), or a stress of compression, and ha its largest value also when $r=R_0$. Putting $p=-\rho$ and $r=R_0$,

$$\text{Limit of } p_0 \text{ for stress } p=\frac{3(R_n^2-R_0^2)}{4R_n^2-2R_0^2}\cdot\rho. \qquad (13$$

The denominators of (12) and (13) show that (12) gives t lower limit of p_0 always. Hence (12) gives the limit of p_0 a the gun would be overstrained by circumferential extension befo reaching the limit of radial compression.

If any three of the four values θ, R_0, p_0 and R_n be given, (12 may be solved for the fourth value. For example, given all e cept R_n, then

$$R_n=R_0\sqrt{\frac{3\theta+2p_0}{3\theta-4p_0}}.$$

Examples.

1. A round steel bar, 20 inches long and 2 inches in diamet has suspended at its lower end a weight of 60 tons. Find t unit stress on the cross-section, the unit strain in length a in diameter, the new length and new diameter?

Ans.: 19.1 tons □″, .00147″, .00049″, 20.0294″, 1.9990

2. A steel bar, with a cross-section one inch square, is under tension of 24,000 pounds in the direction of its axis. What pre sure per square inch on all sides will just exceed the elastic lin or overstrain the metal axially when the elastic limit is 32,0 pounds? (1 ton=2240 pounds.) *Ans.:* 5.36 tons □

3. A cast-steel cylinder has an internal diameter of 8 inches a an external diameter of 12 inches. If the elastic limit be 13 tons per square inch for extension and compression, what is th limit of the internal pressure this cylinder will stand?

Ans.: 4.56+tons □

4. A boiler tube has $R_0=1''$, $R_n=1.2''$ and $\theta=13.4$ tons. Wh is the limit for internal pressure?

Ans.: 2.28 tons □″ (5103 pounds)

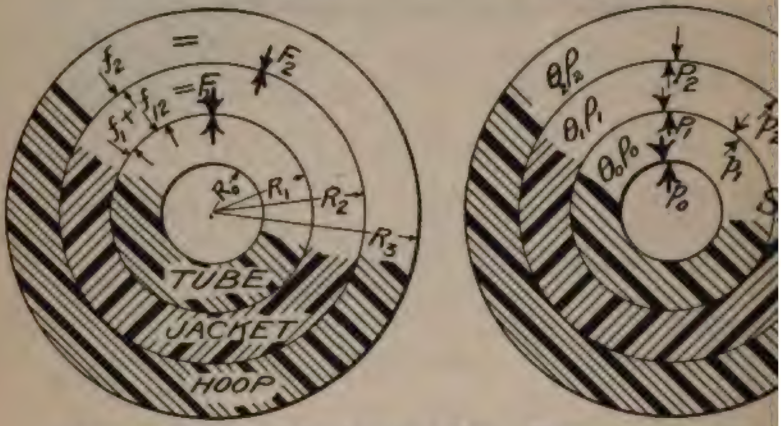
5. If the elastic limit of a gun cylinder be 40,000 pounds per square inch (17.86 tons) and the internal pressure is to be 8000 pounds per square inch (3.565 tons), what is the least possible thickness of the metal with an inside diameter of 8 inches

Ans.: 0.973″.

FIG. 6.

GUN AT REST. GUN IN ACTION.

No powder pressure. With powder pressure



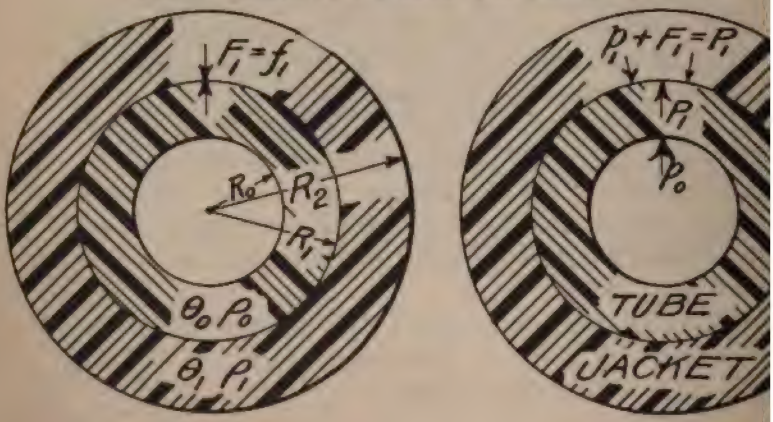
Section of 3-Cylinder Gun, Showing All Pres

(Capitals denote total pressures; small letters, parts of total pressu contact surfaces, due to a pressure at some other surface.)

$$P_1 = p_1 + F_1 = p_1 + f_1 + f_{12} \text{ and } P_2 = p_2 + F_2 = p_2 + f_2.$$

Note that pressures represented by F or f symbols are "at rest" sures, while a p symbol denotes pressures due to the powder pressur a large P total pressures at contact surfaces "in action."

FIG. 7.—Section of 2-Cylinder Gun Showing Pressures.



AT REST. IN ACTION.

CHAPTER II.

COMPLETE FORMULÆ FOR TWO-CYLINDER GUN; EQUATION DIAGRAMS.

Nomenclature for Section of Any Gun.

To avoid mixing symbols and formulæ, when considering a built-up gun of several cylinders, the following nomenclature is adopted (see Fig. 6):

The radii are R_0, R_1, R_2, R_3, etc.; elastic strengths θ_0 and ρ_0, and ρ_1, etc. *In a state of rest* there are certain total pressures, due when assembling the gun to shrinking on the outside layers. At R_1 there is F_1, at R_2 the pressure F_2, etc. At R_1 a certain pressure, f_1, is due to shrinking on the jacket. When the hoop is shrunk on it causes a pressure f_2 at R_2 and a pressure additional to f_1 at R_1 called f_{12}; the subscript 12 meaning that the pressure is at R_1 and comes from R_2. It should be noted that in Fig. 6 $f_2=F_2$, since nothing in this case is shrunk on outside the hoop.

When there is powder pressure in the bore the total pressures are P_1, P_2, etc.; and the additional pressures at contact surfaces above those in a state of rest are at R_1, p_1, at R_2, p_2, etc.

Evidently $F_1=f_1+f_{12}$, $P_1=F_1+p_1$, $P_2=p_2+F_2$, and in this case (Fig. 6) $F_2=f_2$.

S_1 is the shrinkage in inches at R_1, S_2 at R_2, etc.

The Two-Cylinder, Built-up Gun.

In this case (Fig. 7) we have to see that neither tube nor jacket are overstrained in a state of rest or a state of action. That is, F_1 must not crush the tube or extend the jacket too much, while P_0 must not overstretch the tube nor P_1 the jacket.

External Pressure (F_1) *Only on the Tube.*—When the gun is assembled, $p_0=0$, and there is no internal pressure. Letting $p_0=0$, in (9),

$$t=Ee_t=\tfrac{1}{3}\left(\frac{-1}{R_1^2-R_0^2}\right)\left(2F_1R_1^2+\frac{4F_1R_0^2R_1^2}{r^2}\right),$$

$$=-\tfrac{2}{3}\frac{F_1R_1^2}{R_1^2-R_0^2}\left(1+\frac{2R_0^2}{r^2}\right). \qquad (15)$$

From (15) we see *that t is always* $(-)$ *or compression* and has its *greatest value at the inner surface of the tube,* when $r=R_0$ (smallest value of r).

Putting $\rho_0=-t$ and $r=R_0$,

$$\text{A maximum value of } F_1=\frac{\rho_0}{2R_1^2}\ (R_1^2-R_0^2),$$

$$\text{A maximum value of } F_1=\tfrac{1}{2}\left(1-\frac{R_0^2}{R_1^2}\right)\rho_0. \qquad (16)$$

Since the jacket is acted upon by P_1, which is greater than F_1, we need not find the limit of F_1 for the jacket.

Formula (16) does not consider the overstraining of the tube due to an excessive radial stress p, which, as will be seen, requires a greater p_0 than an excessive t does.

Substituting in (10) $p_0=0$,

$$p=Ee_p=-(\tfrac{2}{3}F_1R_1^2+\tfrac{4}{3}F_1R_0^2R_1^2)\left(\frac{1}{(R_1^2-R_0^2)r^2}\right),$$

$$=-\frac{2F_1R_1^2}{3(R_1^2-R_0^2)}\left(1-\frac{2R_0^2}{r^2}\right). \qquad (17)$$

The last terms of (15) and (17) show that p is always less than t; hence, θ_0 and ρ_0 being nearly equal, t will always overstrain the tube first.

Both External and Internal Pressure on the Tube.—In action the tube is subject to the internal powder pressure p_0 and the external pressure P_1. Here we shall see that, depending on certain conditions, either t or p may overstrain the metal. It is assumed that p_0 is always greater than P_1, as is the case with naval guns.

Putting $r=R_0$ in (9) and (10) to get the greatest values of t and of p.

$$\text{Max. stress } t=\frac{2}{3(R_1^2-R_0^2)}\ [p_0R_0^2+R_1^2(2p_0-3P_1)]. \quad (18)$$

$$\text{Max. stress } p=\frac{2}{3(R_1^2-R_0^2)}\ [p_0R_0^2-R_1^2(2p_0-P_1)]. \quad (19)$$

It will be noticed that these equations are similar except for the the last part within brackets.

Since $p_0>P_1$, the expression $R_1^2(2p_0-3P_1)$ cannot have a negative value as great as $-p_0R_1^2$. This shows that for ordinary values of the radii and pressures the max. t by (18) is usually $(+)$, or a stress of extension, and that, if it be $(-)$, or a stress of compression, (19) will give a greater $-p$, or radial stress of compression (evidently $R_1^2(2p_0-P_1)>p_0R_1^2$).

Since $p_0R_1^2 > p_0R_0^2$, the value of p by (19) must be always $(-)$, or radial compression.

Therefore (18) gives the maximum stress for extension and (19) for compression. Substituting θ_0 for t and ρ_0 for p we have:

$$p_0 \text{ max. } \theta = \frac{3(R_1^2 - R_0^2)\theta_0 + 6P_1R_1^2}{4R_1^2 + 2R_0^2}. \tag{20}$$

$$p_0 \text{ max. } \rho = \frac{3(R_1^2 - R_0^2)\rho_0 + 2P_1R_1^2}{4R_1^2 - 2R_0^2}. \tag{21}$$

In order that the metal of the tube be not overstrained the lower value of p_0 from (20) and (21) must be the limit of the powder pressure, so far as satisfying these equations is concerned.

The Jacket in Action.—Here there is no external pressure and there is an internal pressure of P_1 pounds per square inch, the same as was the case of the gun with one cylinder. Putting in (12) $P_1 = p_0$, $R_2 = R_n$, $R_1 = R_0$ and $\theta_1 = \theta$.

$$\textit{The max. allowable value of } P_1 = \frac{3(R_2^2 - R_1^2)}{4R_2^2 + 2R_1^2} \cdot \theta_1. \tag{22}$$

Graphic Illustration of (20), (21) and (22).

Equation (20) may be written in the form $p_0 = A + BP_1$, which is the equation to a straight line.

$$p_0 \text{ max. } \theta = \frac{3\left(1 - \dfrac{R_0^2}{R_1^2}\right)\theta_0}{4 + 2\dfrac{R_0^2}{R_1^2}} + \frac{6}{4 + 2\dfrac{R_0^2}{R_1^2}} \cdot P_1 \quad \text{(20 modified)}$$

In this equation note that with known radii and elastic strength there are only two variable quantities, p_0 and P_1.

Equation (21) may also be written in the form $p_0 = C + DP_1$, another straight line; and (22) may be represented as a point, since the max. P_1 is obtained directly.

Letting $\frac{R_0^2}{R_1^2}$ be represented by "a," (21) and (20) become

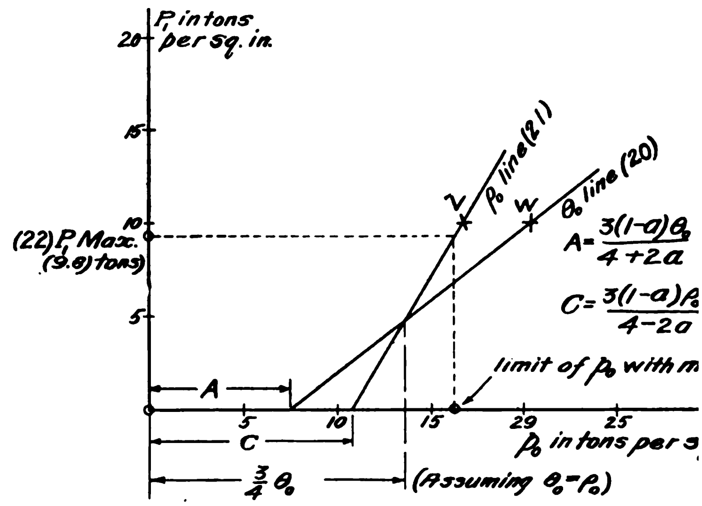
$$p_0 \text{ max. } \theta = \frac{3(1-a)\theta_0}{4+2a} + \frac{6}{4+2a} \cdot P_1. \tag{20a}$$

$$p_0 \text{ max. } \rho = \frac{3(1-a)\rho_0}{4-2a} + \frac{2}{4-2a} \cdot P_1. \tag{21a}$$

Letting $\frac{R_1^2}{R_2^2}$ be called "g," (22) becomes

$$\text{Max. } P_1 = \frac{3(1-g)\theta_1}{4+2g}. \tag{22a}$$

Fig. 7a illustrates graphically equations (20a), (21a) an
The gun is a 6-inch gun and at the section considered
$R_1=5''$, $R_2=8''$, $\theta_0=\rho_0=18$ tons per square inch and $\theta_1=$
tons per square inch. Using these values, we have P_1
$=9.18$, p_0 max. $\theta=7.31+1.272P_1$ and p_0 max. $\rho=10.53+$
Evidently $A=7.31$ and $C=10.53$, giving one point on eac
lines (20) and (21). Now assume $P_1=10$, then fro
$p_0=16.62$, a second point (V) on the ρ_0 line; also fro



Graphic Equations of 2 Cylinder Gun in.

FIG. 7a.

$p_0=20.03$, giving the second point (W) on the θ line. As
at the intersection of the two lines, p_0 should equal $\frac{3}{4}\theta_0$, v
easily shown to be always the case.

If it is desired to utilize the full strength of both jacket a
in action, use P_1 (max.), which will strain the jacket to it
limit and find $p_0=16$ tons (approx.), which will strain t
to its elastic limit of radial compression. Of course, with
the tube is not strained to its limit of circumferential exte

The limits of p_0 may be found as above and of P_1, bu
not know as yet whether the max. allowable F_1 is exceede
the shrinkage is, nor how to get the P_1 actually produced
combination of pressures.

The p_1 Produced by Any p_0 (see Fig. 6.)

From (9), at the *outer surface* of the *tube*, putting $R_1=R_n$, $_1=p_n$ and $r=R_1$, the strain is

$$e_t=\frac{1}{E}\left[\frac{6p_0R_0^2-P_1(4R_0^2+2R_1^2)}{3(R_1^2-R_0^2)}\right]. \qquad (23)$$

Also at the *inner surface* of the *jacket*, putting $r=R_1$, $R_2=R_n$, $_1=R_0$, $P_1=p_0$ and $p_n=0$, the strain is

$$e_t=\frac{1}{E}\left[\frac{P_1(2R_1^2+4R_2^2)}{3(R_2^2-R_1^2)}\right]. \qquad (24)$$

Now suppose p_0 is changed slightly to p_0' and the corresponding ew P_1 is P_1'. Then writing (23) and (24) in the form $e_t=Ap_0$ $-BP_1$ and $e_t=CP_1$, we have for the new strains due to p_0'

e' at outer surface of tube $=Ap_0'-BP_1'$,

e' at inner surface of jacket $=CP_1'$.

The changes in the strains will be the difference between the nd e' of tube and of jacket, but since the two surfaces are in act the change in one circumference must equal the change in other.

The changes in strain will be equal, even though the original rains be unequal. Hence

$$(Ap_0-BP_1)-(Ap_0'-BP_1')=CP_1-CP_1'$$

$$P_1-P_1'=(p_0-p_0')\,\frac{A}{B+C}. \qquad (23\text{-}24)$$

Now if the change in p_0 is from p_0 to zero (gun at rest) p_0' bemes 0 and $p_0-p_0'=p_0$; also $P_1-P_1'=p_1$, since in this case $_1'=F_1$ and $P_1=F_1+p_1$. Taking from (23) and (24) the values f A, B, C, and substituting in (23-24) p_1 for (P_1-P_1') and p_0 for $p_0-p_0')$, we have, after reducing,

$$p_1=\frac{R_0^2(R_2^2-R_1^2)}{R_1^2(R_2^2-R_0^2)}\cdot p_0,\ \text{(the } p_1 \text{ produced by any } p_0\text{)}. \qquad (25)$$

Also

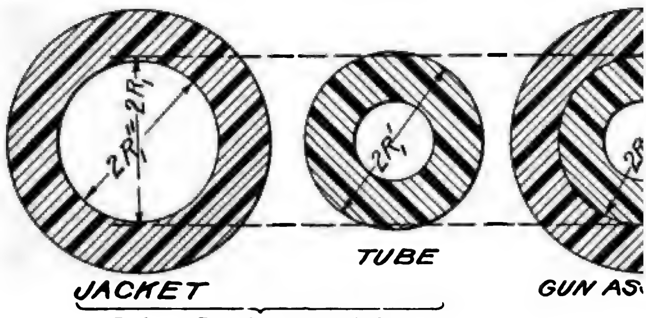
$$F_1=P_1-p_1 \text{ (by definition)}. \qquad (26)$$

This value of F_1 must not exceed its limit by (16), since F_1 is the pressure outside the tube at rest.

Shrinkage Equations.

Fig. 8 illustrates how, when the jacket is shrunk c
the jacket is extended and the tube compressed.

FIG. 8.



Before Gun is Assembled.

(The Amount of Shrinkage is Purposely Exaggerat

Calling the shrinkage at R_1, in inches S_1, then $S_1=$2
or S_1 is the difference in inches between the original *ou*
eter of the *tube* and *inside diameter* of the *jacket.* T

shrinkage called ϕ is the shrinkage per inch of diameter

$\phi_2=\frac{S_2}{2R_2}$, etc.

Now, calling e'' the unit strain of jacket at its inner
ence due to shrinkage and e' the unit strain of tube
circumference, the change in the original inside circun
the jacket is $2\pi R_1''\cdot e''$, and its new circumferenc
$+2\pi R_1''e''=2\pi R_1''(1+e'')$. Likewise the new outer cir
of the tube is $2\pi R_1'(1+e')$. But these are both equ
surfaces are in contact, or $2\pi R_1'(1+e')=2\pi R_1''(1+e$
$2R_1-2R_1''=2R_1''e''-2R_1'e'=S_1$.

From (9) the value of e' is obtained by putting $p_0=$
$r=R_1$ and $R_n=R_1$; likewise e'', by substituting $p_0=$
$r=R_1$, $R_0=R_1$ and $R_n=R_2$. In addition, we assum
$=R_1$, since they are large compared to their differen
error is inappreciable.

heretofore explained; (25) is represented by a line, and shows what p_1 any p_0 will produce.

Of the "*at rest*" (no-powder pressure) ***equations,*** (16) gives the limit of F_1 and (27) shows what shrinkage should be used to produce any desired F_1 (or the F_1 due to any S_1).

A line (28) might be plotted to show the compression corresponding to any F_1 (from equation 26), but is omitted.

The data used is $R_0=3$, $R_1=5$, $R_2=8$, $\theta_0=\rho_0=18$ tons, $\theta_1=\rho_1=24$ tons per square inch. Then $a=0.356$, $b=2.56$ and $c=7.11$. $1-a=0.644$.

Max. $F_1=5.8$ tons, Max. θ of $p_0=7.3+1.27P_1$, Max. ρ of $p_0=10.5+0.61P_1$, Max. $P_1=9.2$ tons, $p_1=0.255p_0$, $s_1=.0034F_1$ or $F_1=295S_1$.

Starting with the limit of $P_1=9.2$ tons, the tube would reach its elastic limit (ρ_0) with 16 tons powder pressure. With $p_0=16$ tons, we see the corresponding p_1 is 4 (+) tons and $F_1=P_1-p_1=5$ tons (approx.). As shown, this subtraction may be done graphically by the "action to rest" line (26), drawn from A to the vertical axis and parallel to p_1p_0 (25). This F_1 must not exceed the Max. F_1 by (16) or the tube will be damaged when the jacket is shrunk on. As shown, the shrinkage necessary in this particular case to produce this F_1 is .016″(+).

Other investigations may be made with the diagram (instead of computing with the equations); for example, suppose the powder charge is reduced to give 12 tons pressure in the bore. We find that the tube will reach its elastic limit (θ_0) with $P_1=4$ tons by erecting a perpendicular from B to C. (Note that the shrinkage must be great enough to produce this P_1 in action. Were it not equation (20) would not be satisfied, so the P_1 cannot be taken from the ρ_0 line, as that would give too much circumferential extension.) At D we find the corresponding F_1 to be $\frac{3}{4}$ ton and at E the necessary shrinkage less than .002″ (all results are approximations).

With such an arrangement as this last one, P_1 falls far below its limit and so does F_1, which shows that, though the tube in action is stretched to its limit, the full strength of the *jacket in action* and of the *tube at rest* is not taken advantage of. Such an arrangement would waste metal and weight. The values of R_1 and R_2 should be changed.

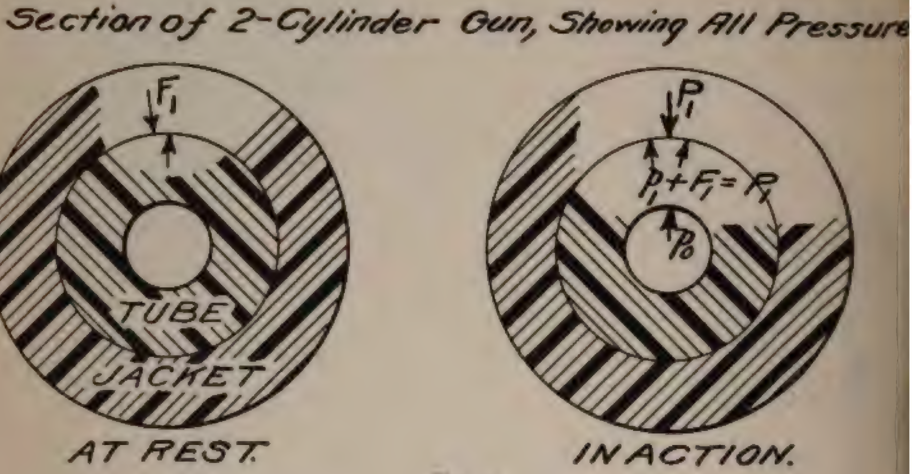

Section of 2-Cylinder Gun, Showing All Pressure
F_1
TUBE
JACKET
AT REST.
P_1
$p_1 + F_1 = P_1$
p_0
IN ACTION.

FIG. 9.

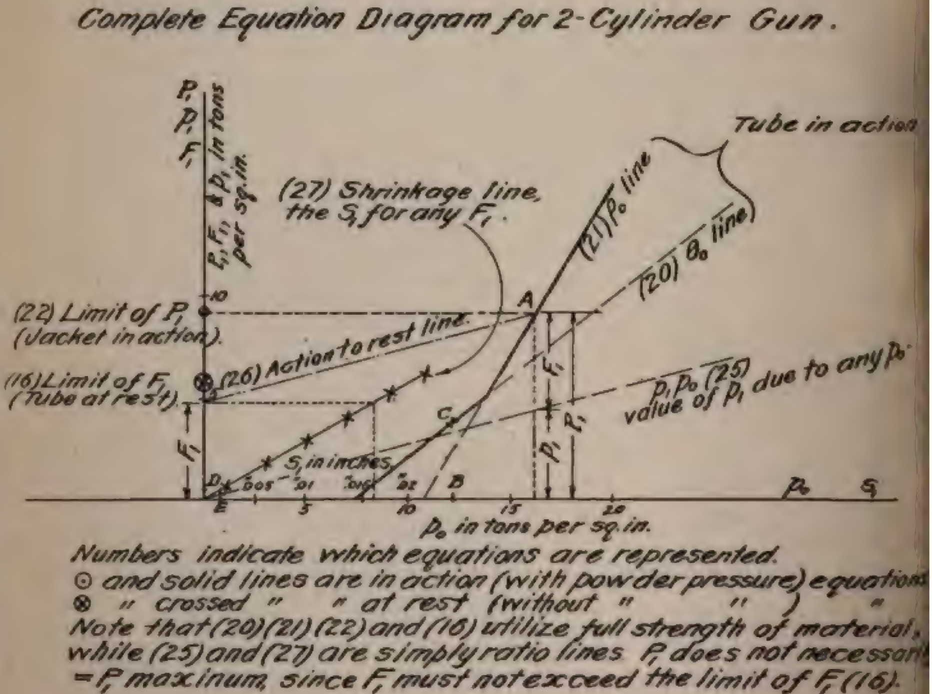

Complete Equation Diagram for 2-Cylinder Gun.
P_1, p_1, F_1, & p_1 in tons per sq. in.
Tube in action
(27) Shrinkage line, the S_1 for any F_1.
(21) p_0 line
(20) θ_0 line
(22) Limit of P_1 (Jacket in action).
Action to rest line.
(16) Limit of F_1 (Tube at rest).
(26)
$p_1 p_0$ (25) value of p_1 due to any p_0
S_1 in inches
.005 .01 .015 .02
A
C
B
D
E
F_1
P_1
p_1
p_0
S_1
5 10 15 20
p_0 in tons per sq. in.
Numbers indicate which equations are represented.
⊙ and solid lines are in action (with powder pressure) equations
⊗ " crossed " " at rest (without " ") "
Note that (20) (21) (22) and (16) utilize full strength of material, while (25) and (27) are simply ratio lines. P_1 does not necessarily = P_1 maximum, since F_1 must not exceed the limit of F_1 (16).

FIG. 10.

$$S_1=\frac{2R_1}{E}\left[\frac{2}{3}\,\frac{F_1R_1^2}{R_2^2-R_1^2}+\frac{4}{3}\,\frac{R_1^2R_2^2F_1}{R_1^2(R_2^2-R_1^2)}\right]-\frac{2R_1}{E}$$
$$\left[\frac{2}{3}\,\frac{-F_1R_1^2}{R_1^2-R_0^2}+\frac{4}{3}\,\frac{-R_0^2R_1^2F_1}{R_1^2(R_1^2-R_0^2)}\right],$$

$$S_1=\frac{4R_1^3(R_2^2-R_0^2)F_1}{E(R_1^2-R_0^2)(R_2^2-R_1^2)}\quad . \tag{27}$$

Having found F_1 by (26), we may find the corresponding S_1; or we may with an S_1 find the F_1 produced.

Change in Bore of Gun Due to Shrinkage.

To find how much the inner diameter of the tube is reduced by shrinking on the jacket, there being no internal pressure in a state of rest, we have from (15) the unit circumferential strain e_t.

Let $r=R_0$, then

$$e_t=\frac{-2F_1R_1^2}{E(R_1^2-R_0^2)}\,.$$

Since at the inner surface of the tube, with no p_0, there can be only a stress of circumferential compression ($p_0=0$ and radial stress$=0$), the radial unit strain is evidently $\frac{1}{3}$ the above e_t, which is at right angles to the radius. Then the total change in $2R_0$ is $2R_0\times\frac{1}{3}e_t$, or

$$\text{Compression of bore in inches}=-2R_0\cdot\frac{2F_1R_1^2}{3E(R_1^2-R_0^2)}\,. \tag{28}$$

For Certain Materials and Powder Pressure Find Radii and S.

If certain metals are to be used in manufacturing a gun, then θ_0, ρ_0, θ_1, ρ_1 and R_0 are known. The problem is to find R_1, R_2 and S_1 for the powder charge, which will produce a known p_0 tons per square inch pressure.

Evidently the gun must be safe and material should not be wasted. As will be seen later, there are also other considerations in practical gun construction.

Considering the inner surface of the tube, it cannot, in a state of rest, be compressed by the shrinkage beyond its elastic limit for compression, ρ_0. Also, when thus compressed, p_0 cannot be larger than that powder pressure which, in a state of action, will change this stress from $-\rho_0$ to $+\theta_0$ (the limit for extension).

Consequently, so far as the extreme limit of p_0 is concerned, th elastic strength of the tube may be considered to be $\rho_0+\theta_0$.

Hence from (12)

$$\text{the extreme limit of } p_0=\frac{3(R_1^2-R_0^2)}{4R_1^2+2R_0^2}(\rho_0+\theta_0).$$

The maximum value of this (when $R_1=\infty$) is $\frac{3}{4}(\rho_0+\theta_0)$.

Generally, $\theta_0=\rho_0$, or the max. value is $3/2\,\theta_0$ and the

$$\textit{Extreme limit of } p_0=\frac{3(R_1^2-R_0^2)}{2R_1^2+R_0^2}\cdot\theta_0. \qquad (29$$

Now R_1 and R_2 may be assumed from similar data for oth guns and the values readjusted after drawing diagrams. O using (29), with the desired powder pressure as p_0, we may sol for R_1 and thus obtain the lower limit of R_1.

Having obtained a trial, R_1, the lines (20) and (21) and th Max. F_1 (16) may be plotted. Taking from the diagram P_1, co responding to the desired p_0, (22) may be solved for a trial val of R_2 and the diagram completed.

Increasing R_1 gives F_1 a higher limit, allows a greater p_0, o for a certain p_0, gives a smaller P_1 and reduces the shrinkage an F_1. Naturally, a thicker tube will, within certain limits, stand greater p_0 and does not have to be compressed so much by th jacket.

Increasing R_2 increases the Max. P_1, allows a greater p_0 an with this p_0 gives a larger p_1, F_1 and S_1.

Problems.

1. For a section of a certain gun $R_0=4.00''$, $R_1=6.35$ $R_2=8.04''$, $\theta_0=\rho_0=18.5$ tons, $\theta_1=\rho_1=21.0$ tons. What is th limit of the powder pressure and the corresponding S_1? Also th compression of the bore with this S_1.

Ans.: 12.64 tons, .0126″ ($F_1=2.01$), comp.$=$.0014″

2. $R_0=6.00''$, $R_1=8.70''$, $R_2=10.46''$, $\theta_0=\rho_0=18.5$ tons, $\theta_1=\rho$ $=21.0$. Find the Max. p_0, corresponding S_1 and the compressio

Ans.: 10.25 tons, .0148″ and ($F_1=1.37$) .0018″

3. Draw diagrams representing the equations used in problem 1 and 2. Find graphically the limit of p_0, p_1, F_1 and S_1.

4. Given $R_0=4.00''$, $R_1=5.80''$, $R_2=7.14''$, $S_1=.0105''$, find F_1, p_1, P_1, Max. p_0 and see whether the limits of P_1 and F_1 are ex-ceeded.

Ans.: $F_1=1.53$, Max. $p_0=10.6$ tons

5. A 12-inch gun is to be built with a tube of mild steel which has $\theta_0 = \rho_0 = 18.5$ tons and the jacket material has $\theta_1 = \rho_1 = 21.0$ tons; at the section considered, $R_0 = 6''$. What is the extreme limit of p_0 if the tube is infinitely thick $(R_1 = \infty)$?

Ans.: $3/2\ \theta_0 = 27.75$ tons.

6. Suppose it was desired to have a p_0 of 18.5 tons with the 12″ gun of problem 5. What would be the lowest limit of R_1?

Ans.: 12″.

CHAPTER III.

THE THREE-CYLINDER GUN AND PRACTICAL GUN CONSTRUCTI

Table II gives the necessary formulæ for computations. T formulæ are derived in a similar manner to those for the t cylinder gun, as explained by Alger and Nulton, and are simpli by introducing *a, b, c,* etc., which reduces considerably the c putation work.

Fig. 11 shows all pressures at contact surfaces and Fig. 1 the complete equation diagram for one section of a three-cylin gun in action; the "at rest" or shrinkage diagram (Fig. comes later.

As explained before, Fig. 11 shows total pressures due to sembling gun by capital "*F*'s" and total pressures at contact faces with powder pressure in the bore by capital "*P*'s," the ot pressure (small letters) show parts of these totals.

It is desired that the gun be as light as is practicable, but tube must not be overstrained when the jacket and hoop shrunk on, nor can any one of the three parts be overstrai with powder pressure in the bore.

There is no danger of crushing the jacket when the hoop shrunk on.

Construction of Equation Diagram.

Equations (30), (31), (32) and (33) are represented in t right-hand quadrant as explained for similar equations of the tw cylinder gun. The "action to rest line" graphically subtracts from P_1 (for any point A), giving at the vertical axis F_1. T process represents equation (34).

The other equations are shown in the left-hand quadrant. (3 and (36) are plotted with P_2 on the horizontal axis and P_1 the vertical axis, as P_1 has already been shown on this latter a

(37) is a point, while (38) and (40) are lines similar to (3 the p_1p_0 line. (38) is used to obtain p_2 and graphically subtr p_2 from P_2, giving F_2.

This subtraction represents equation (39). In a like man (40) gives f_{12}, and drawing a line parallel to (40) subtracts from F_1, giving f_1, equation (41).

TABLE

PRESSURE FORMULÆ FOR T

$a = \frac{R_0^2}{R_1^2}$, $b = \frac{R_2^2}{R_1^2}$, $c = \frac{R_2^2}{R_0^2}$,

Part of Gun.	State.		Formula.
Tube.	At rest.		Max. $F_1 = \frac{1}{4}(1 -$
"	Action.		Max. θ of $p_0 = \frac{3(1 -}{4}$
"	"		Max. ρ of $p_0 = \frac{3(1 -}{4}$
Contact surface at R_1.	"		$p_1 = \frac{b-1}{c-1}$
Tube.	At rest.		$F_1 = P_1 -$
Jacket.	Action.		Max. θ of $P_1 = \frac{3(1 -}{4}$
"	"		Max. ρ of $P_1 = \frac{3(1 -}{4}$
Contact surface at R_2.	"		$p_2 = \frac{1-d}{d(b-1)}$
Hoop.	"		Max. $P_2 = \frac{3(1-d)}{4+2d}$ ·
Jacket.	At rest.		$F_2 = P_2 - p_2$.
Contact surface at R_1.	"		$f_{12} = \frac{1-a}{1-h} \cdot F$
Tube.	"		$f_1 = F_1 - f_{12}$.
"	Shrinkage.	At rest.	$S_1 = \frac{4R_1(1-h)}{E(1-a)(1-g)}$
Jacket.	Shrinkage.	At rest.	$S_2 = \frac{4R_2(c-1)}{Ec(1-h)(1-d)}$

Suppose with a p_0 of 15 tons we wish to use the full strength of the tube and jacket in action, what pressures at the contact surfaces must we have and what f_1 and F_2 (which last determine the shrinkages necessary for this combination)?

Starting with $p_0=15$ tons, a perpendicular to A shows that P_1 must be 12.5 tons, then lines from A to B and B to C show that for $P_1=12.5$ the P_2 outside the jacket must be 8 tons. This P_2 will overstrain the hoop, exceeding the limit set by (37), so we must either use a thicker hoop or reduce the p_0.

For the purpose of illustration it is assumed that this limit is not exceeded as shown.

To find F_2 the simplest scheme is to measure off p_1 with dividers, find at M on (38) the corresponding p_2 and with the dividers take this p_2 from $BN(P_2)$. This subtraction may be done graphically by drawing through K a horizontal line and through B a line parallel to (38). The intersection is D and $DK=F_2$, since BD and MO are the hypotenuses of two identical right triangles with sides $=p_1$ and p_2.

With F_2 we obtain f_{12} from (40) and by drawing from D to E it will be seen that f_{12} is graphically subtracted from F_1, giving f_1 (here also are identical triangles).

Evidently we may start with any of the above pressures (total or component) and find all the other corresponding pressures which satisfy the condition that both tube and jacket are stretched to the elastic limit in action. Note that only the solid parts of lines (31), (32), (35) and (36) should be considered.

Shrinkage Equations. Diagram.

Having found f_1 and F_2, equations (42) and (43) give the corresponding S_1 and S_2. These equations may be shown graphically, as in Fig. 13. Since the same axes have been used for f_1 and F_2, as in Fig. 12, the two diagrams may be superposed and used as a single diagram. This is usually done.

The Use of Formulæ in Practice.

So far we have derived certain formulæ and constructed diagrams which show how the entire strength of the metals may be utilized at any one section of a gun. This would give the greatest saving of metal at that section, but in practical gun construction other things must also be considered.

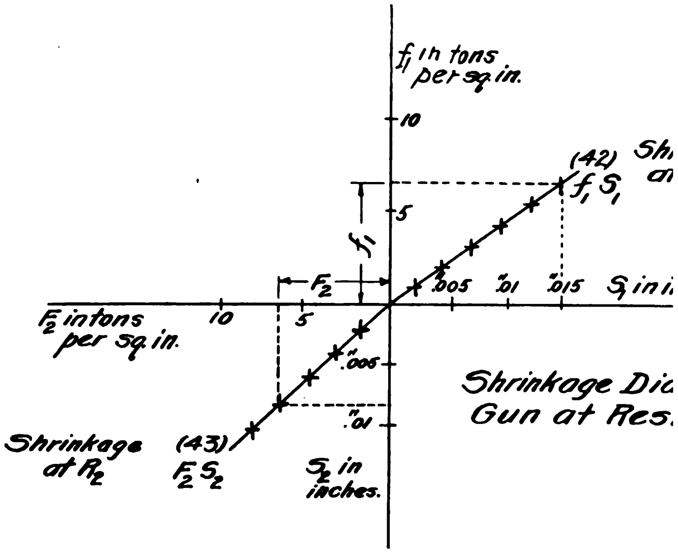


FIG. 13.

Modification of Shrinkages and Limiting Powder Pres
It is desirable that the gun tubes be subject to as little s
possible in a state of rest (the gun is at all times subject to
age stresses); a reduction of the shrinkages will make ea
assembling of the gun, and should any part be overstrainec
excessive pressure, it is best to have the inside of the g
tube) be the first part to give way. Thus none of the crev
be hurt by fragments, as would be the case with the out
of the gun; and the damage before the outer layers ga
could be seen by examining the bore, which would not
case if a middle layer were overstrained first.

These results are obtained by neglecting the limits set b
tions (31) and (36) and working out S_1 and S_2 just as
were no radial compression.

In no case, however, *must the limits for circumferentia
sion,* (32) and (35), *be exceeded.*

Fig. 14 shows the equation diagram, at a section thro
powder chamber, of a 5-inch gun. Starting with the
$P_2 = 4.389$ tons, we find by solving the equations, or from
gram, that a p_0 of 19.3 tons, an $S_1 = .019''$ and $S_2 = .023''$ (
approx.), will just strain the hoop, jacket and tube simulta
to their elastic limits. This combination satisfies all eq

and $S_2 = 0.021''$.
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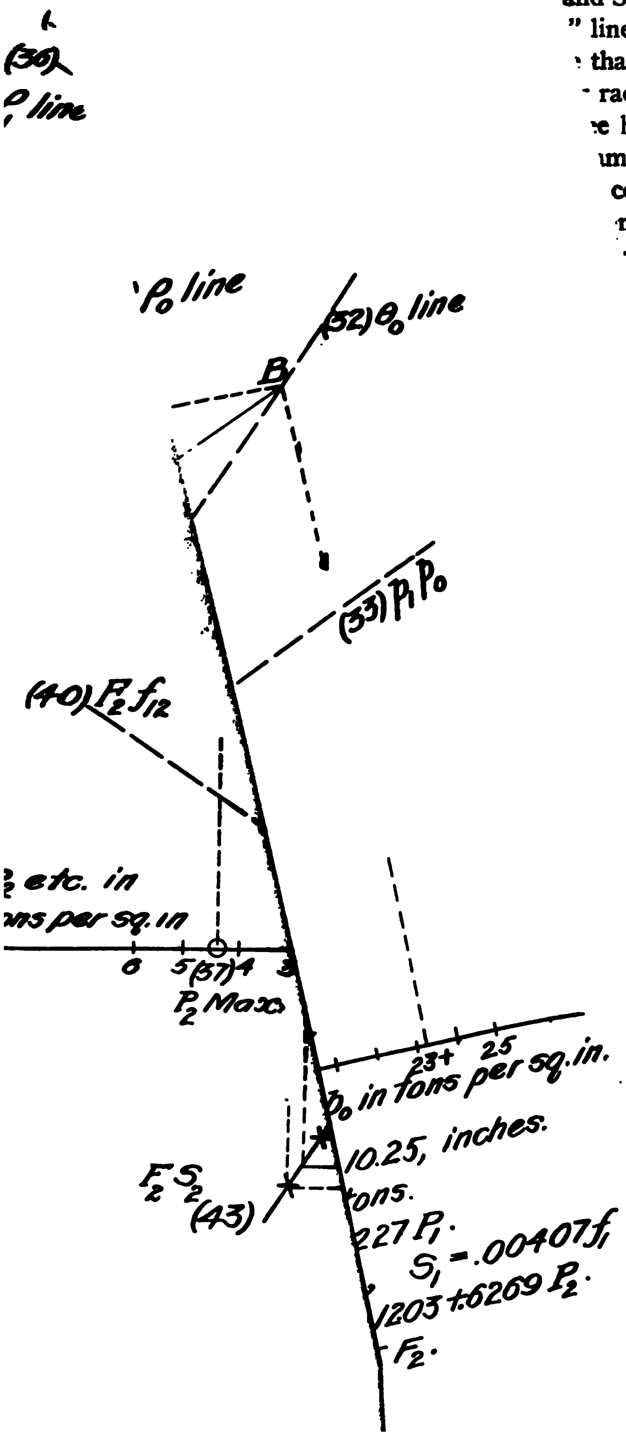


Neglecting (31) and (36), we find $S_1 = 0.0118''$ and $S_2 = 0.021''$. In this case, with the diagram, the "action to rest" line is drawn from B on (32) as (31) is neglected. Here we see that the limit for circ. extension is 23+tons and that the limit for radial comp. is less than the former amount, 19.3 tons. Let us see how much the reduction of S_1 by 38%, and of S_2 by a small amount, will reduce the limit of p_0 when radial comp. is also considered. Working from C, on (31), we find that for $p_0 = 18+$tons, P_1 and F_1 corresponding to these reduced shrinkages are the required amounts for the tube. Also, going from C to D, K, L and N, evidently an $S_2 = .023$, is more than the required S_2. Hence the limit of p_0 will be more than 18 tons, actually about 18.3 tons. By this new arrangement S_1 is reduced 38%, while the limit of p_0 is reduced only a little over 5%.

Evidently the change is very desirable and, as the tube will not be compressed so much when the gun is assembled, it will be the first to be overstrained.

Professor Alger gives on p. 54, formula (55), "Elastic Strength," in this case where S_1 and S_2 are reduced:

$$\text{Allowable } p_0 = \frac{(c-1)}{(1-a)} \cdot \frac{3(1-a)p_0 + 2F_1}{4c-2}. \qquad (44)$$

(See Table II for values of a and c.)

Solving this equation in the example considered we get 18.3+ tons.

Problems in practical gun construction may be solved, either with the equations or the equation diagram, dealing with these modified shrinkages, and they are the ones calculated in practice.

Modifications Affecting the Complete Gun.

When the finished gun is considered the results obtained, as shown heretofore for each section, have to be further modified. The powder pressure is considerably less at the muzzle than its maximum in the powder chamber, so less metal may be used as the muzzle is approached. As a result, shrinkages based upon the equations may vary considerably when passing from one section to the next section of the gun. With such conditions there would be an abrupt change in the shrinkages and also in the stresses. This is undesirable, so a compromise is made and approximately the mean values are taken to avoid sudden changes.

There must be no abrupt changes in the stresses for diff sections, either at rest or in action, and generally a reducti the shrinkage is desirable, so the tube will be the first part tc way.

The bell muzzle has been adopted, because at this point th a violent change in the internal pressure when the projectile l the gun. In several cases gun muzzles have been blown off

Relining the tube or screw box may be necessary on accou wear and erosion. The gun must be strong enough to allo this.

The layer carrying the screwbox must be thick enough to the longitudinal stress caused by powder pressure on the b plug.

Rigidity.—The gun should be rigid enough to prevent it: bending or becoming curved when fired or otherwise.

Factors of Safety.

The following may be called some of the factors of safety The elastic limits used are the lowest allowable test spe limits for the metals used. The true elastic strength is greater than this.

Curves are drawn showing the elastic strength of the (maximum internal powder pressure) and the actual normal sure developed by the powder.

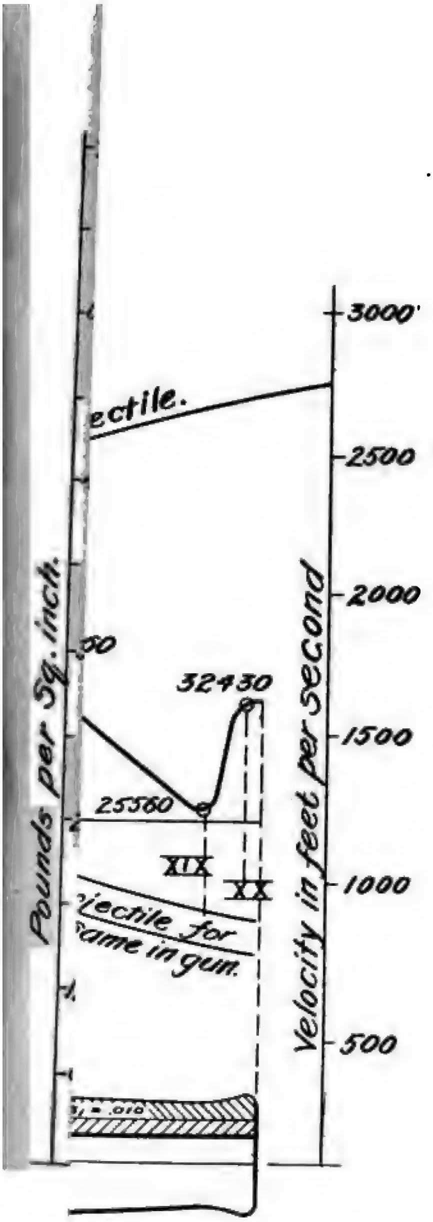
The strength curve must at all points be considerably abo powder pressure curve. In fact, the ratio between the ord should never be less than 1.4 to 1.

Strength and Pressure Curves for a Service Gun.

Fig. 15 shows the curves and shrinkages for an 8-inch Computations are made, as shown at twenty sections, each s being indicated by a Roman numeral. The shrinkages h been adjusted, the total strength of each section for circum tial extension is obtained, giving the points on the upper b curve.

As the projectile leaves its seat at the origin of the rifli velocity gradually increases; and this velocity for all positi the projectile is shown by the velocity curve.

Knowing the velocity of the projectile at any given point gun, the necessary powder pressure to produce this velocit



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be obtained. The lower pressure curve (energy of the projectile) shows such pressures.

Since the projectile is not only given velocity of translation, but also is given rotation, and the frictional and other losses must be allowed for, the ordinates of the lower curve are increased by 12%.

With these increased ordinates a new curve is plotted called the *curve of "maximum powder pressures."* Now, if at A, the highest point on the curve, a tangent be drawn parallel to the base line, as shown, then this tangent shows the maximum powder pressures to the left of A and the curve the same to the right of A. *In no case should 1.4 times the maximum powder pressure exceed the elastic strength for circumferential extens.*

Problems.

1. Given $R_0=6.0''$, $R_1=10.3$, $R_2=15.0''$, $R_3=17.7''$, $\theta_0=17.5$ tons, $\theta_1=22.0$, $\theta_2=22.0$, find the Max. θ of p_0 and the corresponding S_1 and S_2.

Ans.: Max. θ of $p_0=21.79$; $S_1=.0296''$; $S_2=.040''$.

2. $R_0=4.75''$, $R_1=7.50''$, $R_2=11.375''$, $R_3=14.375''$, $\theta_0=16$ tons, $\theta_1=17$, $\theta_2=22.2$. Find Max. θ of p_0, and corresponding S_1 and S_2.

Ans.: Max. θ of $p_0=20.68$ tons, $S_1=.0149''$, $S_2=.0327''$.

3. $R_0=6.0''$, $R_1=11.0''$, $R_2=17.0''$, $R_3=21.0''$, $\theta_0=18$ tons, $\theta_1=19.0$, $\theta_2=21$. Construct the equation diagram; find max. θ of p_0 and the corresponding shrinkages; find F_1 and the allowable p_0 from equation (44).

Ans.: Max. θ of $p_0=23.82$ tons, $S_1=.0287''$, $S_2=.0476''$, $F_1=6.32''$.

4. At Section IV of the 8-inch gun of Fig. 15, $R_0=5.5''$, $R_1=8.0''$, $R_2=11.875''$, $R_3=16.75''$. $\theta_0=55{,}000$ lbs., $\theta_1=60{,}000$ lbs., $\theta_2=65{,}000$ lbs. Find the elastic limit for circumferential extension and the corresponding S_1 and S_2 (the gun as actually constructed has *Max.* θ of $p_0=68{,}840$ lbs., $S_1=.021''$ and $S_2=.037''$).

5. Construct the equation diagram in the case of problem 4.

DISCUSSION.

Prize Essay.

(SEE No. 137.)

COMMANDER A. B. HOFF, U. S. Navy.—The point of view of the expert accountant on the absorbing and constantly developing subject of navy yard economy is a most valuable and interesting one. The *relation of accounting* to navy yard economy is a clear one, and one of vital importance. It is, however, a more constricted question than that of navy yard economy, which is a broad gauge affair, having many phases.

If a ship or shop is inefficient or uneconomical, a card index will sometimes help to locate the trouble, but it takes *sound practice working on sound principles* to cure it.

This I believe to be the universally accepted axiom in the industrial world. The way I read the essay, Paymaster Conard emphasizes the fact (*sic*) that if you have the right persons running a business it doesn't make much difference how your business is organized. Now I believe this to be all wrong, and in explanation of such belief will touch on several places in the essay to explain my position.

Those that have had actual experience in navy yard work know that many of the things that look delightfully simple on paper are full of difficulties. I believe a number of points made in the essay give the impression that in certain channels of administration things are not practically or efficiently managed. While I am not capable of holding the brief for navy yards, either in the accounting or industrial departments, I do not believe conditions are as I, personally, seem to gather from the essay as a whole. Not only have a large proportion of the essayist's suggestions been going on at navy yards for some years, under directions from the different bureaus, but the methods are being improved all the time, under the stimulus of zeal and the desire to work together.

Although all men are human, I do not believe that this desire to work together is absent from the officers of navy yards, as one might be led to infer after reading pages 52, 53, and 54.

The thorough and interesting discussion of accounting and its possible relations to a system of navy yard work is the most comprehensive and invaluable addition to this subject that has yet appeared. This we might rightly expect from the essayist.

From a discussion of the matter with officers actually at navy yards now, what we really seem to want at a yard is an accounting system that will give the detailed statements of (I) the actual cost against an appropriation of every industrial job order; (II) comparative cost, on a similar system, with other navy yards. This is not easy, and I understand has not yet been satisfactorily developed.

Let us take those portions of the essay where a different opinion is held from the essayist.

INTRODUCTION.

The essay reads, "Readjustment of navy yard organization, and new distributions of authority over component parts will never of themselves produce great economies. . . . . Unless a constant incentive urges us forward not only do we fail to progress, but we fall back."

The essayist is here, I believe, in controversy with probably all employers of labor and administrators of industries in every part of the world. It is usually claimed that what he says does *not* produce economy, is, on the contrary, exactly what does produce it. As to incentives in the navy, those that have hitherto furnished its progress, will continue to do so. These I take to be personal pride, an interest in one's work, and the esteem of one's brother officers. We cannot in the service substitute any others. They have and are carrying us well at present.

I submit that the organization of navy yards is the foremost essential to economy, and in this organization a sound cost and accounting system has its vital place. However, this system is of chief use to the Navy Department, not in primarily showing the quasi-industrial cost, but in showing the comparative cost at different yards of similar work.

The results of the accounting and cost systems are for the benefit of the industrial heads at the navy yards, so that they may find waste by another method than the ones employed by them in the administration of their shops, etc. If the accounting system does not do this, it has not yet reached its ultimate development. When it does do this, I claim further information is supererogatory, and hence an unnecessary complication and administrative cost.

As the essayist states, the separation of the military and the industrial costs in a navy yard is necessary. Otherwise it would be impossible to compare industrial costs at different yards.

The difficulties are great but the system can be made uniform for the different yards. Unfortunately the essayist gives no suggestions as to this. Conference and agreement between the yards, with departmental approval of the result, should solve this problem.

Sound navy yard *economy* lies somewhere between the ideas of the extreme military party and the extreme industrial party. And let it be noted that economy and cost are different things—both in civil and naval establishments.

There is only one way to start in to arrive at economy. That is by first considering sound principles and then sound practice.

"Principles" is organization; "practice" is administration.

It must be considered what are the industrial reasons a navy yard exists for military purposes, and what are the military reasons a navy yard exists as an industrial plant.

It is respectfully submitted that the principles on which the *present navy yard organization* is laid down are the solution of the problem.

In other words referring to the quotation from the essay at the beginning of these remarks, I claim the essayist is entirely in error.

Again, the essayist lays down on page 5, the "Difficulties in the Way of Economy." They are indeed as he has written them.

He omits, however, an important point. That is, the "employment of labor" question. No industrial concern could survive if required to engage, employ, and discharge workmen on the system laid down for navy yards. Here again is a point where comparative cost does not, and never will, show comparative economy.

THE MILITARY POST AND THE INDUSTRIAL PLANT.

On page 13 the essayist has, I believe, fallen into an error, common to some in the service, and to nearly all civilians. This is, that navy yard work can be compared, cost for cost, with civil commercial plants. By such I understand the term "Industrial Yards" to mean. If this term "Industrial Yards" is intended to mean merely the few ship-building concerns in the country, the ensuing remarks then have a narrower meaning, but are not otherwise affected.

From conversation, however, with civilians engaged in commercial industries, I believe that what was in mind in the quotation were large manufacturing plants employing many men of the trades similar to those found in a navy yard.

Leaving aside the principle for which a civil industry exists (to make money), and a navy yard industrial plant exists (to prepare the materiel of the fleet for action), the underlying error in most comparisons—administrative as well as cost, but especially cost,—is, that civil plants are almost entirely *manufacturing* and navy yard plants are almost entirely *repairing* plants. The essayist mentions this fact, but lays no stress on it. Whereas it is the *whole thing*, practically speaking.

Manufacture by a repair plant is costly, and so is repair by a manufacturing plant. In manufacture, "detail repetition" is the key note; in repairs the "job order" is the unit of work.

Of course space forbids dilation on this point, but is not the essential difference clear enough to show the greater or less futility of *actual cost*, as an industrial comparison of economy, between a navy yard and a civil manufacturing concern,—*even if* the former had no military features as a modification? Of course we further befog the civilian by calling our repair plant the "Manufacturing Department."

As to the industrial plant of the New York yard being worth twenty millions, the essayist himself admits no civil concern would sink so much money in a plant that produces relatively such a small percentage of the capital invested.

Does not this of itself somewhat enfeeble the deductions made by the essayist as to the great advantage to be derived from comparison with actual commercial costs.

Then he says: "But the New York navy yard under different and improved methods of financial and administrative management could equal the output of the private plant, without increasing the extra labor expenses that have been cited." Not only is this statement unbelievable to the writer, from a mercantile point of view, but nowhere in the essay do I find any suggestions as to how this is to be done, nor a discussion of the case in any of its bearings. It is certainly a grave impeachment of present methods without adequate representation of logic.

ESTIMATES.

Practical experience in estimating at navy yards would, I think, modify many of the expressed views of the essayist. I remember a type case, renewing the deck plating of a collier in dry dock.

A large crane was handy; transportation to the plate shop was cheap; the collier was to remain in dock three weeks. The estimate was $700. A few days after work had begun the dry dock was needed for another ship for some military reason, and the collier was tucked away in the best available spot, taking into consideration all the other work going on at the yard. At this spot there was no handy crane. The transportation of material was expensive. The time element of labor much increased, as well as the cost of handling material. The job eventually cost $1200. This is a type case only.

As to comparing the estimate for repair work at a navy yard with the estimate for the same job at a private plant, as no basis for comparison can exist by the very nature of the case, it is a dream pure and simple. By this I don't mean that you cannot take one set of figures given you by the navy yard and another set given you by the civil yard and say which is the greater.

Each may be honest figures, too. But they do not mean the same thing and are on totally different planes of reference.

This can be seen by noting that private plants do little repair work considered as a percentage of their total output, while it is the other way around for navy yards. This being so, we have already noted the complete difference of principle and practice governing these two different kinds of industrial endeavor.

Another thing should also be noted. When shipyards do repair work, unless it is a very large job indeed, the ship they do it on goes to their yard, as a rule, either because they are nearby, or, if more than one yard is at hand, as on the Clyde or Delaware, they go to a yard for various other reasons.

Page 29, last paragraph, does not coincide with the usual navy yard practice as I have found it.

The estimates in a majority of cases are remarkably close and generally a little over the resulting charged cost. This is a matter the Inspection Officer is especially charged with and watches.

As a matter of fact all shops and divisions make their estimates almost exactly on the scheme proposed by the essayist, and have been doing so for many years (pp. 31 and 32). How else could estimating be done?

The omission by the essayist of any mention of the duties and functions of the Inspection Department, leaves a vital and necessary branch of the present organization out in the cold. As this department probably tends toward economy more than any one single force in the present system failure to mention it is unusual.

MANUFACTURING AT NAVY YARDS.

Under this head the essayist covers the ground familiar to navy yard officials. The essayist broaches as something quite new a system of ma[illegible]

ufacturing articles at different yards, the locality depending on the economy obtainable. This system has been going on for years.

And just as the essayist says: "to fill requisitions for stock."

ADMINISTRATIVE METHODS.

In the brief discussion, or rather remarks, that are given this very comprehensive subject, two notes seem to stand out clearly.

One is, that the *organization* of a yard is immaterial for the conduct of work and economical production, and the other is the essayist's unfamiliarity with the manager's office in a navy yard.

As to the latter, I venture to say that he will find in general carried out already his extensive suggestions on pages 53 and 54; and that there is a thoroughly just appreciation of the duties of manager in that quarter of the industrial plant.

At the top of page 53 the essayist says:—"The grouping of these shops into one or two divisions is merely a question of administrative expediency, ... Either plan will work, and work well, provided the right men are in charge."

It is impossible to read this other than that the essayist believes that personalities, not principles, are of sole value in a big business. Unfortunately most large commercial concerns think that one is as important as the other. In fact that the base requirement is the "organization."

As all students of the navy yard question know, the present navy yard organization is the one in vogue at practically all shipyards in the world. Is this an indication that shipyards believe that the question of one or two divisions is simply one of administrative expediency? Or is there some economical industrial reason underlying this universal practice? We know enough about business interests to know that if that is the "type" organization there is economy in it. Anyone who has had experience at a private shipyard knows that the two divisions there work along together just about as independently as the divisions at a navy yard, that they are subject to just about the same amount of "management," and that each one has about the same "growls" as our own divisions.

We have nothing to learn from them there.

The ultimate expression of this claim advanced by the essayist that "persons, not principles" are what is important in industrial work, is found on page 53 (bottom) and (top) 54. Not only would this be introducing an extra person between the commandant and the industrial activities of the yard, but it is a query as to where we would expect to find officers of the Pay Corps or Construction Corps who have been trained in the preparation of the fleet or its units, *in all departments*. Commercial practice is, that it takes *both* principles and persons to be successful.

CONCLUSION.

In conclusion let us note the following, on page 58.

"It is, of course, possible to produce economies without reference to such an accounting system. As a matter of fact, an accounting system does

not of itself produce any economies at all. It merely points out where the loss is going on, so that better methods may be instituted."

How does the essayist reconcile this statement with the one quoted at the beginning of this article. "Readjustment of navy yard organization, etc., will never produce great economies."

If organization won't do it and accounting systems won't do it, what will then?

What is economy? Is it the cost of some individual piece of work compared with the cost of another individual piece of work? If that is so, then the question whether the work is done rightly does not enter. And yet whether it is done rightly is a question of organization.

The last paragraph of the essay says: "In the course of time there is every reason to believe that naval plants, instead of being at the bottom of the ladder of industrial efficiency, may be at the top, and serve as models for private plants to pattern by."

What is the "bottom of the ladder" of *industrial* efficiency?

Where does the comparison begin? Where does it end?

Is it cost per job order compared with some outside firm? I think not.

Is it all possible economy of money? Undoubtedly.

Let us not be led astray by failure to note the fundamental differences and fundamental likenesses between naval and commercial plants. Until we absorb these, with a just appreciation, we are apt to arrive at comparative economical results that are all wrong. But as the essayist declares, "a good accounting system is a necessity."

LIEUT.-COMMANDER A. M. COOK, U. S. Navy.—Paymaster Conard has introduced a subject for discussion which will be interesting and profitable for the service as a whole, and particularly so for those who are engaged in navy yard work. It is believed that the discussion can be extended without limit as to space or time with advantage to those who are attempting to solve the problem of efficient management of the many large industrial establishments under the Navy Department.

It is hardly to be expected that all will agree with the author, and he anticipates this point in his remarks.

Discussion is based primarily on differences of opinion, and I shall proceed without enumerating the many generalities with which all must agree.

It is believed that economy, in its true meaning to the navy, is not properly interpreted. Economy, or efficiency, is measured of necessity in dollars and cents, and by comparison with some standard.

The question of this standard is of the first importance in this discussion. I believe the paymaster is in error in trying to make commercial cost a standard, as I gather is his intention.

There is no doubt that when commercial costs are less than yard costs, other things being equal, articles should be purchased in the open market. This is the general practice already. There may be some articles still manufactured in yards, however, which could be better purchased in the market, and the question in this connection is to determine how much it costs to make them.

This brings us to the question of the method of determining the cost of navy-yard work. The costs of the clerks in the Accounting Officer's office, and of the clerks in the manufacturing department, it is assumed all will agree, should be included in the ultimate cost. In my opinion much of the expense now charged to Title "S" should also be included. When we are determining a figure to compare with commercial prices we should include a factor for interest on investment and depreciation, and these as well as others should be considered, especially when new equipment is to be purchased for the prosecution of new work. On the other hand we should have an allowance made when the equipment is of a general nature and especially if it will be valuable or is necessary for work of such a nature that it must be done in our yards.

In the end economy is measured by efficiency, and the proper standard for comparison of much the larger part of our work must be the cost of similar work at other navy yards, and with standards which we ourselves establish.

These standards are measured by time primarily, and because time is money, it is generally possible to report results in dollars and cents. A recent article on bricklaying in one of the magazines is the illustration of the establishment of a standard. If Mr. Taylor had assumed as a standard the rate of work of bricklayers in Chicago, or any other place, to determine if his workmen were efficient or not, he would have been satisfied with old results. But instead of that he established his own standard, and that is exactly what we must do, each one for himself. Then compare results of one yard with another to find out who has made the best standard. After comparison we will find that generally we can learn something from our neighbors, the other yards. We must exchange freely our methods and results with the idea of always arriving at a better way. It is only by such methods that we can attain results which will be satisfactory to all. Our work will not admit of general comparison with commercial establishments at present. But that is no reason why we should not strive for efficiency. The profit and loss account will not serve the purpose.

As an illustration we will assume that Fort Mifflin and St. Juliens, both magazines being similarly equipped, in every way, were doing similar work on powder. Assuming the cost of labor for preparing a 12″ charge is the same, then the efficiency of both would be the same. The cost of material for a charge is about $135.00 at St. Juliens while at Fort Mifflin it is $180.00. Here is a difference of $45.00 in material, while all the labor involved, including all indirect charges of every kind is only about $2.00. It is evidently unfair when this work is being done by the hundreds or thousands, to establish a unit cost and charge or credit P & L with the difference.

On page 5 the paymaster specifies several elements which interfere with economy. Let us look at them.

1. If laborers are kept on the roll and paid when they are not necessary it is inefficiency on the part of the management, and the labor cost at that yard will increase. This is a point which is believed now to be largely

eliminated. The maintenance of shops in which little or no work is being done is an expense to the government and is part of the legitimate cost of work at a yard. In addition to maintenance there should be interest and depreciation added, thus the extra equipment which is not used, while it affords facilities, adds to cost, which is considered proper.

2. The maintenance of yards at Algiers, Port Royal, etc., while an expense to the Department, in no way affects the cost of maintenance of other yards.

3 & 4. I do not feel that any objection can be made against these laws. They are just and reasonable. The fact that they exist is only one of many reasons why ultimate navy yard costs cannot be compared with fairness with commercial costs.

5 & 6. No comment necessary.

7. It is not understood wherein the method of appropriation increases costs, except the additional work in accounting. This is very small, and under present methods is not included in navy yard costs.

The author has assumed that it is desirable to compare our costs with commercial "selling prices". To my mind this is not only impracticable as a general rule, but is inadvisable and unnecessary. By the establishment of efficiency standards and the comparison of these standards of one yard with those of another yard, as well as the resulting costs, we will have progressed, and will have a foundation for future improvement which will eventually lead to efficiency. And what we are striving for is efficiency with economy rather than economy alone. If we attain the former our result is the desirable one, while we might achieve economy at a serious cost in our ultimate efficiency.

There are many excellent ideas expressed in the essay, and of course there are the axiomatic remarks with which no one can differ. But, on the whole, the idea of a profit and loss account does not appeal to me as a reasonable one.

The establishment of a standard of cost is fairly well illustrated by considering the details of making 12" bags:—

The work was divided into parts and costs of each part determined as follows:—

	Unit time in minutes. Minimum.	Maximum.
1. Laying out cloth preparatory to cutting	0.60	0.67
2. Cutting body	1.28	1.28
3. Cutting tops	1.30	1.87
4. Marking body for location of flap	1.07	1.20
5. Sewing body and flaps	4.28	9.37
6. Sewing top in bag	7.50	11.11
7. Making straps	1.00	1.50
8. Sewing straps on top	3.75	4.61
Total	20.78	31.61
At 41 cents	1.88	1.95
At 31 cents	18.90	29.66

The laying out and cutting is done by 1st-class ordnancemen at 41 cents per hour. All other labor at 31 cents per hour. The unit cost of bags was thus from $0.110 to $0.16657, depending on the skill of the different workmen, and the minimum becomes the standard. One of the more skillful men, doing all the different items in succession, did four bags in 1½ hours, or at unit cost of $0.116. This rate was more than could be expected to be maintained, but was a demonstration that the standard was reasonable.

Since this standard was established, in Nov., 1909, the methods of handling the work have been modified. Power is now available for sewing and cutting, a reel for holding a bolt of cloth has been made to facilitate laying out, and the workmen, by reason of more experience, can do faster work. Workmen have been sorted so that none but efficient men are used at the work. The result is shown in the fact that the latest cost for labor for these bags was $0.06497. On account of the change in conditions a new standard should be established.

CIVIL ENGINEER P. L. REED, U. S. Navy.—The prize essay on "Navy Yard Economy," published in the March PROCEEDINGS, urges at length the potency of "sound accounting methods" in promoting navy yard efficiency and would further elaborate a system of accounts, put into effect within the last two years, which, in its turn, was considerably more involved than the practice which preceded it. Lest there be danger of too ready acceptance of the claims of advanced accountancy as a panacea for industrial ills, and of the promotion of book-keeping as a predominant art and factor in the economical administration of our navy yards, some things may well be set down as counterweight, to avoid upsetting the balance which we need in our efforts to promote real efficiency.

There can be no question of the author's statement on page 4 that with practically fixed annual appropriations, a saving of two million dollars each year of what is now industrial waste would aid military efficiency materially, but this can hardly be considered an argument that such a waste may be saved by a different method of keeping our books.

Then comes the commonly accepted doctrine that men work for rewards, such as money, honor or distinction, and desire to excel, and then a search for a yard stick with which to measure excellence or to determine relative efficiency in those in responsible charge of work in order that it may be duly rewarded. This is taken to be Cost of output,—Cost with a large C—a cost for each product of the establishment, which shall be the exact cost and not a near cost. Navy yard costs are considered as made up of "factory costs" consisting of direct labor and material and an allotted proportion of indirect department and shop costs; plus managing, office, etc., expenses; making the "production costs." (Most writers commence with "prime cost" represented by direct labor and material only.)

The author considers that costs of production so determined can be made a fairer test of efficiency than is possible in target practice or steaming contests. It may be worth while to examine a little into the indirect charges which with direct labor and material (prime cost), make up the "production cost."

It may be stated at once that there is no generally accepted way of distributing general or indirect expenses to individual products. Some experts recommend one way, some another and others are impartial and give you a choice of half a dozen, each method giving a different production cost for any given element of output. Each has certain advantages over the others in particular cases.

General or indirect expense is made up of many entirely dissimilar items, having little or no connection with each other; many of them without any bearing whatever upon the efficiency with which work is being conducted in a given shop, yet this indirect expense must be lumped and spread some way or other over the output of all the shops to obtain the "production costs" upon which to base efficiency.

Because the yard supports a powerful floating crane, expensive in first cost and maintenance, in order that it may perform a vital function possibly once a year, should this reflect on the efficiency of the foreman patternmaker by increasing the "production costs" with which his efficiency is to be measured? Or let us say that in one yard, power obtained from a waterfall is purchased at one cent a kilowatt hour, while in another it is produced from expensive coal in an old plant and costs 3½ cents a kilowatt hour. Is the master shipfitter or the construction officer at the former yard to be given this advantage in measuring relative efficiency in turning out steel barges?

Rather would it not seem that prime cost—that is direct labor and material only—would be a better measure, imperfect as it is, due to many causes which occur to any one giving the subject a moment's consideration. It must appear to the ordinary man that the statement that production costs can be made a more reliable measure of efficiency than target practice with guns and ships of the same class, with all conditions standardized so far as possible or steaming trials under like conditions, is by no means self evident, and that the presumption is all the other way.

The author, aiming to obtain comparative "production costs," finds it manifestly necessary first to eliminate "military" expenses from the overhead or indirect expense of the industrial plant and points out the difficulties in determining what, or in what degree, given expenses are of a military or non-industrial nature.

This segregation is difficult enough; some would put it stronger. Take the floating crane used as an illustration above, a general office building, shops and power plants to which expense has been added in original construction and maintenance for architectural embellishments or other display. Electric lighting becoming a government institution but in excess of manufacturing requirements, dry docks, sea walls, etc., etc.

The author suggests the following test as a solution. "Does it in any way benefit or assist the production at the yard?" To some this may appear to be begging the question.

As shops have never been and probably never will be built in navy yards to make or save money, the suggestion that the costs be capitalized on paper and accounts be kept of fictitious interest and taxes, does not appeal strongly.

Allowances for depreciation are also necessary to the perfect "produc-

tion cost," lest we deceive ourselves as to the true costs, but is an officer to be handicapped on his efficiency record if he happens to be ordered to a yard which has a lot of superfluous high priced equipment, a percentage of which must be written off and added to the expense of the output of his shops?

Depreciation and renewal accounts imply a normal basic equipment to be brought up to par from year to year or at longer intervals. Few shops have any such status. Some are old and being gradually abandoned, others are new and are being more or less gradually equipped. The distinction between renewals and betterments is as difficult to draw as that between military and industrial expense. Similar remarks apply to fire insurance accounts where the risk is assumed by the owner. Some private corporations maintain such depreciation and insurance accounts in order that a close estimate may be obtained of the surplus or deficiency resulting from operations extending over a certain period, as a year or more, as a guide in the declaration of dividends or other important financial action. This practice is by no means universal or even general in corporation accounting, where there are definite results to be attained. The navy yards are in no such position; the words "profit," "loss," and "dividends," can hardly be strained to have any application to navy yard operations.

The culmination of the author's recommendations, however, is an account called "profit and loss" from some vague analogy to the similar accounts in commercial establishments.

It is made up chiefly of differences between the yard "production costs" and market prices, or costs as estimated in advance by the yard manufacturing or surveying officers, as the case may be. Here is a grouping of separate and unrelated items into an account, which, when obtained, would mean nothing whatever. Any value it might have could only be made available by picking it to pieces and considering each element on its merits. No valid reason appears for assembling them at all.

Having tried, in this brief discussion, to invite attention to some of the difficulties to be overcome in determining "production costs" and their doubtful usefulness as measures of efficiency when obtained, it remains to be added that assuming the cost of an article or service is accurately determined on any basis whatever, the important question arises as to what was obtained for the expenditure.

A cost expressed in dollars and cents means nothing till we know what we got for it.

If it was one of the jobs which make up the greater part of a navy yard's industrial activity, it was different from any other job ever performed, and assuming we know exactly what it cost, we have by no means determined the efficiency of the expenditure and in many cases have hardly started.

As a matter of fact, advanced cost keeping of the kind here considered is in its most unfavorable environment in an establishment such as the average navy yard where work is irregular, extremely varied, and mostly of a repair nature.

The author in a "Conclusion," sums up his recommendations and as this discussion has attempted to show opposing considerations in order

to assist in a fair discussion of the claims of still higher methods of accounting in navy yards than those now in force, some of the conclusions must be questioned.

The author considers that "economy in navy yards can be generally introduced only by the installation of a thorough system of accounts which will cover absolutely all classes of expenditures (this, by the way, must be effected by any system of book-keeping in which balances are struck), throw into relief the major extravagances and block off or circumscribe the channels through which money flows in such a way that no part may escape into that indefinite region lying between 'military expense' and 'cost of production.'"

It may be submitted that a prorated general expense account, which is to form a part of the cost of production of each article does not throw anything into relief and that few regions are more indefinite.

As the author adds, "an accounting system does not of itself produce any economies at all, it merely points out where the loss is going on." But would the "production cost" of a job in a navy yard, containing a small share of a hundred unrelated items of general expense having no real connection with this job, point out anything tangible? Ordinary accounts are criticized by the author because they confine attention to obvious extravagances. But does not an obvious extravagance give a better opportunity for correction than a vague indication that production costs are high. Again the common methods are criticized "because the efforts of a few reformers only are utilized on certain specific details." It is submitted that all improvements and reforms are effected in just that way, by taking up specific details.

The mere knowledge that total costs are higher than we think they ought to be is of no service in itself towards reducing them; but when we find that a man is taking two days to do a job that we know is usually or can be easily done in one, we have something to take hold of and some chan[ce] of improving our administration. Old fashioned prime costs tell us th[is] quicker than modern "production costs."

Much improvement in the way of uniformity and consolidation of [ac]counts, and standardizing classifications of the items of general expe[nse] has been effected in navy yard accounting in recent years.

Given prime costs of output, i. e., direct labor and material, classi[fied] by jobs and shops; the items of shop expense, also classified under sta[nd]ardized sub-heads; the cost of power and of general expense by co[m]ponent items likewise standardized; all for any given month, which present system already provides, before prorating indirect expense individual jobs; and the man in responsible charge or a superior definite data which he can use in that way which best suits his pre[sent] needs, applying indirect expense to those individual jobs which he de[sires] to investigate with the judgment which comes from a knowledge of special conditions affecting the yard and the job. This process canno[t be] covered by an arbitrary set of rules to be applied by a bookkeeper, there appears to be no intrinsic necessity for working it out for e[very] job in a navy yard but only from time to time for large or typical jobs.

It must not be forgotten that accounts can never take the place of s

judgment, that a relatively few primary and definite costs are more useful than a mass of indefinite secondary costs, and that general reforms are always made up of concrete individual items, selected out and given power by the temporary concentration of force upon them.

The railroads representing by far the most important single mechanical industry in this country do not attempt to distribute their indirect charges over their product, transportation, but under the direction of the Interstate Commerce Commission classify their expenditures in a uniform manner and are content to give the number of ton miles, passenger miles, train miles, etc., on one side and the classified expenditures made in producing these results on the other, leaving it to each expert to apply these to his judgment in the way which best suits the purpose in hand. May not there be a valuable precedent in this practice brought about by the efforts of probably the largest group of able accountants and statisticians to be found in any industry in the world, who have a much greater incentive for determining true costs than exists in a navy yard, since the corporate and physical existence of a railroad depend on a favorable balance between revenue and expense.

CAPTAIN T. W. KINKAID, U. S. Navy.—Paymaster Conard's article presents a scheme for navy yard accounting that looks promising. Much hard work, however, would doubtless be necessary during the period of passing from the present system to the one proposed. As stated in the paper, an accounting system does not of itself produce economies; it merely points out where losses are going on, in order that better methods may be instituted.

I am in agreement with the author in his contention that what is needed most of all is decentralization. The Navy Department now attends to countless details that should never get beyond the Commandant's Office.

Another statement that will doubtless command much approval is: "A simple proviso in one appropriation limiting the total amount to be employed in navy yards for clerical and drafting force would be much more business like." The delay now experienced in getting an additional draftsman or clerk when needed is a source of exasperation as well as a barrier to economy. Decentralization might ameliorate this condition. No commercial firm could do business if hampered in procuring clerical or drafting assistance as are the officers of a navy yard.

The suggestions as to improved methods of appropriating funds appear to be sound; but whether Congress can be induced to accept ideas that make for simplification in administration and accounting remains to be seen.

One statement of the author's that I find myself unable to agree to is to the effect that navy yard plants offer an *exceptionally* good field for the application of the ideas of Mr. Taylor and other efficiency engineers. Doubtless improved methods can be introduced anywhere; but a navy yard, where repeat work is not the rule, is far from being an ideal field. However, if additional clerical and scientific assistants are allowed, improvements in expedition and economy of work can be effected.

While the author must be congratulated on the thoroughness of his

paper considered as a treatment of the subject of accounting at the navy yards, yet under the broad title of "Navy Yard Economy" much could have been said as to special means of economizing, such for example as abolishing some of the yards; consolidating the manufacturing divisions; and improving the rapidity of the purchasing system for tools and supplies needed in manufacturing. Ox-team purchasing methods are not suited to the present age of high speed steel and improved shop management.

C. A. CARLSON, CIVIL ENGINEER U. S. NAVY.—The author of the essay entitled "Navy Yard Economy" has apparently set out with the conviction that the successful conduct of large industrial or engineering works is primarily dependent upon, and made possible by, the adherence to certain forms of general accounting. This may be the reason for the use of the word "economy" in the title, but the article also goes into several phases of engineering management and some considerations of political economy.

While the words "economy" and "efficiency" are used as words to conjure with by certain schools of men, there are at the present time indications of an optimism as to results possible by certain systems that later experience may show to have been unwarranted. In every phase of human endeavor, continual attempts are being made to find shortcuts and methods that apparently give something for nothing, or at least are an improvement over the law of the conservation of energy. We continually reach out for prospects that would seem to prove that 2 plus 2 can, in some cases, be made to equal 5.

The writer states that "it is possible to save fully two million dollars per year by proper methods of administration, accounting and accountability." This figure must, therefore, have been arrived at by adding together the saving under administration, that under accounting, and that under accountability. To bring this estimate down to where concrete figures can be scrutinized, the writer is sure everyone would like to see the detail figures going to make up the total of the estimate. In this case, a specific figure being given, the whole discussion would be of much greater value if the itemized savings were set forth. It might then be possible, step by step, to try out any one item and see whether or not the estimated saving could actually be realized.

"THE DIFFICULTIES IN THE WAY OF ECONOMY."

Under the above heading the author makes use of the word "economy" in a different sense from the ordinary accepted meaning of the word. If, in place of economy, which is a relative term, the words "lowest cost" were used, the various items operating against such would be pertinent. For instance, the eight hour law, which has the effect of increasing the rate paid per hour, has nothing whatever to do with the question of economy. If it has, it needs but a simple examination to show that the only place in the world where ships can be built with economy is at the works of the large English ship builders. The question that is presented at a navy yard is not whether by working 10, 12 or 14 hours a day the first cost of a piece of work can be reduced, but is one as to whether during the eight hours

of work, the maximum results for that length of endeavor are obtained. The question of the eight hour law is a matter of political economy which lies outside of the province of the Government's servants to alter.

The statement is made that "The Navy possesses a number of independent industrial concerns which, judging from the history of industrial development in the United States, are capable of being welded into one vast corporation under one general management in which economies can be introduced which would not be possible if plants were run separately." If the navy yards have ever been independent industrial concerns this must be news to everyone. The great stumbling block in comparing the constructive activity of the Navy is due to the fact that the Navy Yard has been compared to an independent shipbuilding plant, where the entire management is local, from the President of the Company down. The navy yards not being manufacturing plants in the true sense, but jobbing repair plants doing incidentally some ship construction, it would seem that a much clearer understanding of their relation to private concerns and the Government would be derived by drawing the comparison between a naval organization and a large railroad system. The individual navy yards from the early days of the establishment of the departmental system, have occupied coordinate positions in the organization of the Navy. If one considers that each navy yard is an organization like that of a division on a railroad, it will be noted in the first place that divisions are established on railroads in order to divide up the work into groups that can be efficiently operated by the division superintendents. In the same way, if the Navy were small, but one navy yard might suffice, were it not for the fact that consideration must also be given to strategic and geographic conditions. The navy yards, instead of being connected by railroad tracks, are in communication by water routes, but the problems to be met at the yards are similar to those encountered in each division of the railroad. The battleships, like the locomotives, require repairs from time to time at the division shops, and while in commission bring into operation all the functions that are met with in handling the material of the Navy. As the Navy Department, through its bureaus, exercises jurisdiction over the various functions that can most advantageously be controlled by various department heads, so does the railroad system, through its various vice presidents, or department heads, exercise control, each in his own bureau or department. The division superintendent is generally the local representative of that department chief exercising management over the operation of the trains. The division superintendent, like the Commandant, has under his supervision the various division officers, each charged with carrying out on that division the corresponding functions that are exercised by the various heads of departments at headquarters. On the Union Pacific Railroad there is being tried out a system whereby in the absence of the division superintendent the various other officers, such as *division engineer, master mechanic* and *train dispatcher* are all termed assistant superintendents, and each one is available to take charge in the absence of the division superintendent, thereby training each one in the entire problem of that division, rather than leaving it to the chief clerk or secretary to act for the division superintendent.

While the outline of the railroad organization is brought up at this point, it may be noted that toward the end of the article the author advocates a system of inspectors who shall oversee the work being done for the respective bureaus. As in the case of the railroads, the actual result of such a system would be a duplication of all the assistant superintendents or working heads of departments. For each master mechanic in charge of railroad shops, a master mechanic inspector would be required; for each division engineer, a division engineer inspector would be required; for each division train dispatcher, a division train dispatcher inspector would be required. The railroads consider the division superintendent as the man sufficient to make all inspections on that division, and for the more technical works, the chief engineer of the road, the engineer in charge of maintenance of way, and the superintendent in charge of motive power, are expected to keep in touch with the work being carried out locally on each division by their local agents. The interests of the divisional officers being the same as that of the higher officials of the railroad, there is no occasion for the employment of inspectors merely as watchmen, when the work is being performed by the railroad's own forces. When the work, however, is done by contract, the railroad as well as the Government, as a necessary part of the execution of the contract and the protection of both interests, must provide for continuous inspection, but this expense is a necessary evil. Why any one should advocate the application of such a system, where there is no incentive to skimp the work or change the design for personal financial advantage, is not understood.

"THE DIFFICULTIES IN THE WAY OF ECONOMY."

The author states that the incentive for commercial efficiency is the desire to excel, and that this same incentive can be utilized in our navy yard plants, and then proceeds to outline a method of competition to obtain such comparisons. It seems that the functions of the accounting system, as laid down by the author are so comprehensive that, the machine once started in operation, there will not be so pressing a need for trained administrative officers; that it will be possible to devise an elaborate system of tables, or possibly a slide rule on which all the conditions of any problem could be set down and the result obtained would register accurately the effect of such expenditures.

If as a result of years of analysis there have been discovered certain relations between all the elements that enter into the cost of any product, it would seem that long before this the mathematicians would have evolved for us the equations that would give the solution of all the problems. Every time that the writer has brought in to his mind a concrete problem to be measured by any system, it has always seemed that the number of variable quantities so far exceeded the number of equations that could be drawn, that a mathematical solution was out of the question.

Except for the purpose of trying to find out whether it would pay the Government to actually manufacture articles on a commercial scale, the details going to make up the production cost are not the determining factor in the questions of economy as respects the performance of the large part of the navy yard work. It would seem that true manufacturing,

that is, the making of articles of one kind by continuous repetition, is a field which the Government in the first place can not have contemplated entering into, and secondly, it would take but a superficial investigation to satisfy one that a manufacturing plant engaged solely in rolling steel rails, or casting pipe fittings, or manufacturing sheaves and blocks, could produce such articles at the lowest cost, and that a concern engaged in jobbing repair work and the assembling of manufactured parts, could not enter any one of these special fields with financial advantage.

The work of true manufacturing plants permits of the application of a more uniform system of accounts than is possible on a railroad or in the Naval Establishment. The fact must not be lost sight of that in all questions of cost there is the greatest danger of accepting as absolute, figures and combinations of the same which are built up on estimates and hypothetical divisions, items composing which may have no actual relation such as the figures would apparently indicate. The questions before the railroad in making repairs to its locomotives, cars, track, bridges, stations and terminal buildings, are similar to those presented at the navy yards. The railroad once established enjoys a monopoly within certain limits of territory and to maintain its charter, must operate. It has been found that for successful operation it can not go out of business because some other railroad can actually haul the freight to certain points at less cost, either by reason of a larger volume of work or freight handled, or by a more favorable construction of the road. It would be suicidal for the railroad to let a contract for carrying its freight or doing its work to the other road, and at the same time be obliged to keep its own road running with a reduced tonnage; all the freight that could be more cheaply carried being placed by contract with the other road.

This is the position in which most of the navy yards are to be found. Their construction is not entailed by any reasons of commercial necessity. Congress can not have justified its appropriations to the Navy on the ground that this work could be done more cheaply than if it were all placed in the hands of commercial firms. This does not prevent the Government, however, from endeavoring to do its work with the greatest economy, but in making a comparison between its work and that of a commercial concern, the question of economy can only be determined relatively. The Government may do a piece of work on the eight hour basis with relatively greater economy than a private concern requiring ten hours a day. If all other conditions were equal and the Government produced a piece of work in eight hours at the same cost as the same work by the private concern in ten hours, it is readily seen that the Government's work was in reality more economically performed, although the total cost in each case was the same.

"THE MEASURE OF EFFICIENCY."

The author's scheme for the establishment of a fictitious profit and loss account which is first introduced under the head "The Measure of Efficiency," resolves itself into a scheme of premium, bonus, or profit sharing, without rendering any financial return to the workmen or the officers producing the profitable results, or deducting from their pay the losses. This

brings up the question of administration and yard management, an theoretical profit and loss account is of more than paper value, it be reasonable to conclude that the employes and officers interested be granted one-half of the profits, the remaining half being retaine possession of the Government. A practical application of this idea, would conclusively demonstrate the fallacy of considering this pa count as having an actual reality in dollars and cents, in fact offic perienced in estimating construction or repair work would need demonstration to satisfy themselves of the outcome.

THE MILITARY POST AND THE INDUSTRIAL PLANT.

The division of a navy yard into a military post and an industri is purely theoretical. Following the same line of reasoning it w logical to classify portions of the battleship hull, engines and bo industrial functions, inasmuch as the same facilities may be obta commercial practice, and the military functions as only such parts ship as the armor, the guns, the magazines and special supports t In other words the representation that the navy yard has two and distinct functions is analogous to treating a successful battlesl commercial vessel built to carry upon its decks the guns and arm gated by a merchant crew and fought by a military force. It wou in the same way the railroad might try to separate its motive po pair shops, and its station buildings from its cars, locomotives an rolling stock, because, forsooth, the one equipment finds a counte commercial plants and private establishments, and could be let out tract, whereas, the large locomotives and cars are never of any use on the railroad system.

"COMPARISON OF EXPENSES IN PRIVATE AND GOVERNMENT INDUST PLANTS."

The author takes the ground that there can be no real comparis commercial work, unless an arbitrary assumption is made classify yard as military and industrial, and that no real economies can be unless such a comparison can be made.

The writer does not see anything to prevent the cost of all work yards from being classified and rearranged in as many combinations particular investigation as may be disired, if the expenditures for pa are definitely known and described by the various job orders. For ticular investigation to be of value for comparative purposes, all the elements would have to be given their proper weights, and when i down to the concrete problem, you have the estimates based on th ment and experience of one set of men to compare with anothe in the private concern, which in turn, has all the local variations into account and properly weigh. What the value of such a con would be is problematical. In any case, the comparison would ne be made after the job was finished and the next extensive piece would have entirely different conditions, and would require new es and result in a new series of costs. The question that would ar navy yard (should it be the policy of doing all of the work by priv

tract), is to what extent would the more or less fixed charges be reduced thereby. Remembering that the construction of navy yards is determined by similar conditions which require the railroads to do their own operation, construction, and repair, it will be seen that whether a great deal of work is done therein or not, the yards are supposed to be able to furnish certain facilities in time of war, as experience has demonstrated that the Government can not depend upon private plants to be constructed for the contingency of war and the work that might then come to them.

If this is accepted, the effect on expenditures at navy yards by reason of yard work could be best shown if the Government were to let all the work each year to a private firm at a cost plus a percentage, or cost plus a fixed sum basis, or some very elaborate unit price basis, sliding scale, etc., the contractor to have the use of all machinery and equipment available in the yard, and charges being made for rental of the tools, etc., sufficient to recompense the Government for actual wear and tear on the plant. By such a method the Government, although doing the work by contract, would make full use of the buildings and machinery which it possessed, and the contractor would not have to figure the rental of buildings, machinery, etc., in his bid on the work. If it were possible the next year to do exactly the same amount and character of work by Government labor under the same conditions, a fair comparison might be possible, otherwise the many variable elements that enter into the cost of any work would be impossible of practical comparison.

The work being all performed by contract at the yard, we would now apply in place of the author's test question, some test like this: Is this expenditure necessary irrespective of whether any productive work is going on in the shops? For instance, the sewer system has to carry off the rainfall from the roofs and streets whether "school keeps or not."

On account of the difficulty in specifying in detail the exact nature of ntemplated work, it would be no doubt impossible to secure satisfactory ids on any other system than one of cost plus a percentage with such a iding scale that will make the contractor exercise all proper economy in e conduct of work, having in mind both lowest first cost and ultimate ficiency of both product and plant. The writer is not advocating any ch system, but is using it as an example to try to make clear the relative fect of doing work at the yard or outside of it. In this connection, hower, it may be noted that many of the most reliable engineering firms in e country do not take contract work, except on a system of actual cost us either fixed sums or a scale of percentages. This has resulted in elimating the gambling element introduced in all contract work on the lump m basis. It may surprise one to find that the fixed charges of the vy yard will be reduced but very little were such an experiment ied. The contractor would be obliged to duplicate the navy yard organation by his own set of departmental officers and the naval officers who eviously acted in that capacity would have to be retained by the Govnment as inspectors. The Government would actually be paying for a plication of the more highly paid officials, and it would require a corsponding amount of crowding of the working forces to offset the same.

CAPITALIZATION OF NAVY YARDS.

That all attempts at separation of navy yards into two parts is purely academic and calls for the exercise of the judgment of various parties would, in the first place, operate to further accentuate the local conditions to be found at each yard. There is no such thing as a simple calculation that would accurately establish such a division. In the example quoted for the sewer system, the author states that "the cost would be divided, other things being equal, according to the value of military and industrial buildings served." What relation the sewer system has to the value of buildings is beyond understanding. For an arbitrary assumption, this will do as well as any other, but that there is such a relation between the value of buildings and the cost of a sewer system is not recognized in the engineering profession at least. The division of the sea wall between industrial and military is another arbitrary assumption that has no physical existence. The sea wall is certainly built to hold back the filled ground and to permit ships to go alongside, irrespective of whether the ground may one day be used for productive labor, or the next day as a drill ground for soldiers. The ship alongside likewise may one day come up for repairs and the next day may make use of the quay wall for receiving aboard its provisions and stores. It would seem to the writer much more logical and productive of more accurate comparison to classify charges under specific objects so far as possible as do *railroads and municipalities*. The accountant then could group them in any way that suited his particular investigation, but the actual work or process would not be encumbered by a multitude of theoretical charges for depreciation, interest, etc., to be applied daily on all jobs. The accounting system which the author discusses appears to relate to the capital accounting, which in large concerns pertains to the headquarters office, and it would seem that a great saving in clerical charges would be possible if such accounts were only compiled at one headquarters for the entire navy, thus employing all the expert bookkeepers and accountants in one central office, rather than setting up a similar one in each navy yard. It would not complicate the actual work at the yards if the various expenditures were sorted, grouped and analyzed in a central office.

The author's idea that "our navy yards could very well be bonded" might be business-like for a private concern that in any case expects the consumer to pay the bill—interest on bonds and all as represented in the selling price of its product—but to advocate under the plea of economy that the people as a whole shall defer the payment of the cost of running the Government when they have the cash and instead resort to paying interest on bonds as well is a novel proposition to advance on such grounds. This would certainly be paying a high premium for an accounting system just for the sake of obtaining "business-like" conditions.

DEPRECIATION.

If it is worth going into at all, it would seem necessary to be as exact as possible. Why not analyze each kind and class of equipment and find out as definitely as possible the actual conditions that have been found to apply in the past. Authorities differ as to which of three methods had

best be used. The author advocates the simplest method,—that of charging off an equal amount each year. A second method charges off a fixed percentage of the decreasing net value, and the third method known as the annuity is still more complicated. But after all figures of this kind can easily be swept aside when in a concrete case the question arises "shall this machine be scrapped and an improved one purchased?" How many successful plants could have justified their wholesale abandonment of almost new machinery to install new and improved tools if an accounting system was the factor that automatically weighed and decided the matter on the basis of depreciation and other charges?

If the world did not move—if conditions did not change daily—if inventions ceased—in other words if progress reached a fixed point and stayed there—then from that time on a number of the variable factors which accounting systems try to make laws for, might more nearly become constants in our equation of condition.

ESTIMATING AT NAVY YARDS.

Under the system of grading the efficiency of department heads and foremen by the profit and loss account, the author need have no fear but what the estimates will gradually work higher and higher, and if he has any doubt about it let him try the actual sharing of the profit between the employes and the Government as previously suggested by the writer. "This question of estimating is a big one" say the author, but he calmly soothes his mind with a conclusion that "there is some uniformity in the various operations which go to make up the various classes of completed work."

When one tries to analyze a few apparently similar cases and deduce therefrom a general relation, the magnitude of the problem begins to dawn on one. To an accountant such a simple operation as cutting a chip of iron off a casting in a lathe would no doubt appear a readily determined factor at a glance, but it took a man of Mr. Taylor's ability years of experimentation and study to arrive at the conclusions found in his book on the "Art of Cutting Metals."

The question of estimating is bound up with that of *cost keeping*, and as the general accounting systems in commercial concerns have been developed by bookkeepers and accountants, the distinction between cost keeping and bookkeeping has been lost sight of in many instances.

That the private concerns which accountants would hold up to us as models are not finding smooth sailing either, can be ascertained from the working heads of such establishments. When it comes down to a question of bidding on a work and getting the job, does the engineer find any safe ground to stand on by consulting the mass of bookkeepers' accounts compiled from past work? His estimate must build up from such unit costs as he knows from actual experience are most nearly comparative.

The aim of the engineer is to analyze all costs on a unit basis, which requires taking into account the recording of conditions under which work is done and the making of measurements which are factors outside the province of bookkeeping.

In trying to develop methods of cost keeping many contractors, manufacturers and railroads have endeavored to develop a cost keeping system

the bookkeeping department. The results to-day are systems of bo
:ping wonderfully complex, but showing very little that can be used
iving at unit costs of working value. Cost keeping is a recent devel
nt less than a generation old and as it resembled bookkeeping in
: of figures, it has been regarded as an evolution of bookkeeping, w
a fact it was not originated by accountants but was evolved and
oped by engineers for the very reason that keeping a set of books
:ounts did not enable one to obtain any facts of value for estimat
poses.

Cost keeping involves the use of standards of comparison which do
er into bookkeeping in its original form, nor can the use of stand:
tacked on to bookkeeping without complicating both kinds of recc
l obtaining a hybrid that is neither bookkeeping nor good costkeep
st keeping records need not balance to a penny, and therefore req
less clerical work than when it is attempted to combine them intc
ounting system. The engineer knows that even when the cost of ev
ng is analyzed to the smallest part of the operation certain ı
ns have been assumed, but that the figures are sufficiently accurate
ure estimates and safe to use in judging of the degree of progress n
the work from day to day if he is also in touch with the work.
iter believes that no accounting system will undo the past, and tha
main function of all accounting systems is to make a record of sc
ng gone before, it profits one little to sit at a desk and figure out
ny dollars we lost last year or last month. The man competen
et the situation is the one who can go out on the work and see
ıself who are the inefficient workmen, where are the parts of the
.t are not utilized properly and be able to "strike while the iron is l
This brings us back finally to the old question of dealing with hu
ure, and what actually counts most toward getting results out oi
n. Has any machine, or accounting system, actually demonstrated
erior results are possible by it over an extended period of tim
npared with having trained men in the right places.

Does not the Navy's experience in observing work of contractors
e and time again that the executive forces of the organization ı
mar the profit. The exercise of true executive ability on the
those in charge means that every step will be planned out ahead
ht tools and materials on hand at the right place and the right
foresee and oversee in such a manner is true engineering "the
ll with one dollar what any fool can do with two."

For persons thus engaged in constructive work, the figures that a
st value to them are *daily costs* analyzed as to unit quantities and
operation. From day to day with live cost records, comparisons
rections are possible; after the job is finished it is too late. Any l
ough inefficiency are then a reality.

The writer does not wish to be understood as disparaging the u
ious accounting systems. What is taken exception to is the tl
ıt such systems possess an inherent virtue that will bring forth effic
d economy throughout industrial or Governmental activities.

Professor Hatfield, of the University of California, speaking of cost accounts, emphasizes the fact that "It is impossible to frame a system of cost accounting applicable to establishments of different character. Iron works producing a single form of staple commodity, a factory making a few standard grades of cloth, each involving a succession of separate processes, works manufacturing special machines, where it is desirable to learn the cost of the entire machine and each of its parts, and a shipyard undertaking special contracts each needs an entirely different system of keeping its cost accounts. No general scheme of forms can be outlined which will apply to all of them, nor can a scheme be outlined which will apply in detail to the *different individual establishments* of a single class of undertakings."

Dicksee has said, "It need hardly be pointed out that the requirements of undertakings carrying on a similar business are by no means uniform. Special and local considerations have to be taken into account and the most desirable system of any particular undertaking can only be ascertained after a full and detailed inquiry has been made into its *peculiar circumstances and conditions.*"

Prof. Hatfield also points out the following considerations—"Three points of uncertainty arise even in regard to the best system of cost accounting.

The first is whether the information acquired is after all worth the expense of acquiring it. This is more than doubtful in some of the more elaborate and expensive systems of costkeeping that are occasionally introduced. To take a flagrant and notorious case the cost system introduced into the Government Printing Office seems to have cost decidedly more than it was worth. In this instance the Committee investigating the system reported that "It is principally to be criticised upon the score that in an attempt to secure all classes of detail, the amount of labor entailed upon each employee for the purpose of recording necessary facts, and the amount of labor required for subsequent tabulation were so great as to make the system almost prohibitive." [1]

The second point of doubt is as to the degree of accuracy which may be obtained and the danger from treating as actual what is merely hypothetical."

APPROPRIATIONS.

Approaching the subject from the author's viewpoint that success only lies in remelting and recasting the Navy in a certain system of moulds borrowed from a certain school of accountants, there is no doubt that the language of these appropriations does present obstacles in that case. Congress still seems to adhere to the old fashioned idea that foundry work of this character is peculiarly within its own province.

Instead of larger lump sum appropriations the tendency seems to be to subdivide and more definitely classify them. If we do not attempt to carry into our appropriations the estimates or figures obtained under an accounting system, it will be seen that the appropriations are no bar to

[1] LX Cong. 1 Sess. H. Doc. 974, p. 11.

any system. In the one case job orders are classified and charged in accordance with the purpose of the appropriation, in the other case they are regrouped, restudied, proportioned, and prorated according to any system of accounts that may be desired. This sort of accounting need only be made at one central office and not attempted at each individual navy yard, whereas the yards need only be concerned with the present system of charging to the proper appropriations as required by law. The reliability of any comparisons between yards would also be much more certain if compiled in one central office by the same group of men.

To do justice to the comprehensive paper by Paymaster Conard, the writer in bringing forth a different viewpoint has been obliged to discuss it at some length. The writer does not claim originality in many of the ideas set forth, as they have been considered by various writers on such subjects for years. One point that the writer believes should be recognized is the fact that various authorities hold quite different views on these subjects, showing that accounting systems can not be reduced to an exact science like that of mathematics.

Early Days in Japan.

(SEE No. 137.)

WILLIAM ELLIOT GRIFFIS, L. H. D.—With thanks and congratulations for the "India paper" editions of the PROCEEDINGS, and also for Captain Arthur C. Hansard's delightful paper on "Early Days in Japan," permit me to supplement his account of what, in the *Century Magazine* for April, 1892 ("The *Wyoming* in the Straits of Shimonoseki"), I ventured to describe as follows:

"In the annals of the American navy, no achievement of a single commander in a single ship surpasses that of David McDougal in the *Wyoming* at Shimonoseki."

Captain Hansard's account adds one more to the others and happy are we to have his hearty words from across sea. Having myself interviewed officers and men who were in the fight, and Japanese who were behind their guns, including some eminent statesmen, as well as talked with or read the autograph narratives of French, Dutch, English and American officers and sailors in the Shimonoseki battles, I am glad to make some amendation or corrections of statements in Captain Hansard's most interesting paper.

Page 144, in place of "Shimadzu," read Shimoda (now famous for its quarries which furnish stone for the new Government buildings in Tokyo).

Page 144. "Ronins," as foreigners knew them, were "armed bands"; yet we must not forget that these "wave men" were often scholars, men of research, prophets of the better day coming—anything but smug salary-drawers, sycophants or causeless haters of foreigners. There was mutual misunderstanding in those days. The good ronin helped mightily to bring in the era of to-day. He was a man born out of due time.

Page 145. It is certain that "the Japanese," i. e. the tottering Yedo government or suzerain Tycoon were powerless to coerce the Prince

(feudal vassal, daimio) of Satsuma. Indeed the Shogun's minister sent pilots to McDougal—one of whom (Heco, formerly of Baltimore, Maryland) told me the story of the fight, from the inside, as he saw it.

Page 148. So far from the Americans then (in 1864) being represented in the great battle of the four squadrons against the Choshiu forts, only by "one unarmed, chartered vessel," the *Ta Kiang* under the American flag had a thirty-pounder rifled Parrott gun, from the U. S. sailing ship *Jamestown*. With this superbly drilled party of thirty marines and sailors, Lieutenant Frederick Pearson not only kept his gun hot, firing at 3000 yards, but actually beat in aim and frequency the (clumsy) hundred-pounder Armstrong breech-loader on the British *Euryalus*. Pearson then towed the boats of the landing force, and later, quickly landed the fifty-six wounded of the fleet at Yokohama. Captain Hansard was probably too busy on the British flag-ship *Conqueror* (101 guns) to notice this.

The Washington Government paid $25,000 for the charter of the *Ta Kiang* and for ammunition expended, etc. The number of rounds is in the official report.

The whole fleet consisted of 17 ships, 338 guns and 7590 men, against the 75 or 80 Japanese battery cannon. It was because of the *Ta Kiang's* presence under Pearson, that our Government received one fourth of the indemnity of $3,000,000 as did Great Britain with her 9 ships, 5156 men and 228 guns! ! !

Page 150. Mr. Heusken (Mr. Hueksen or Heutsen, of the British Legation) was the brave, efficient, but rash secretary of our Minister Townsend Harris, at Shimoda and Yedo. He was assassinated at night. His imposing funeral was finely described in Sir Rutherford Alcock's book "The Capital of the Tycoon."

Page 155. "The *Wyoming* having fired fifty to sixty shots in all" —exactly, 55 rounds in 110 minutes.

Page 156. In addition to the $12,000 collected by the United States on account of the firing upon the S. S. *Pembroke*, our nation mulcted Japan of $750,000.

Then after the money had lain in the treasury untouched, for Americans have a conscience, until it doubled itself by compound interest, Uncle Sam generously returned the original sum, and pocketed the interest—after deducting prize money for the *Ta Kiang's* and *Wyoming's* men. Proud as I am of my countrymen's valor and skill I am glad I spent years in agitating for the return of the indemnity.

Pages 155, 156. No praise can be too high for McDougal. Alas that such valor and patriotic devotion can be so little known, so generally forgotten, or so slightly mentioned in histories of the U. S. Navy.

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rivadavia	28,000	Fore River Shipbl'dg Co.	Building.
Moreno	28,000	New York "	"

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Radetsky	14,500	Trieste.	Under trial.
Zrinyi	14,500	"	Launched April 12, 1910.
Erzherzog Franz Ferdinand	14,500	"	Under trial.
Viribus Unitis	20,000	"	Building.
V	20,000	"	"
VI	20,000	"	Authorized.
VII	20,000	Fiume.	"

It has commonly been assumed that the first battleships of the Austro-Hungarian Navy would bear the names of *Kaiser Franz Josef* and *Tegetthoff*, but up to the present they are officially known as "IV" and "V," and the *Armee Zeitung* asserts that the first of them will be called *Viribus Unitis*. The succeeding *Dreadnoughts* bear the designations of "VI" and "VII." The first of them will be built at Trieste by the Stabilimento Tecnico, and the other at the Danubius Yard, Fiume. The latter place is being enlarged to the capacity of *Dreadnought*-building by the assistance of the Hungarian Government, who are also prepared to open a gun factory at Diosgyör, which is about 140 km. WNW. from Budapest. Although Admiral Montecuccoli has secured the adoption of a program, and there is no navy law, it is interesting to note that the German system of regarding new ships as substitutes for old ships, describing them as *Ersätze*, has been adopted in Austria-Hungary, and that the four new *Dreadnoughts* are to replace four old wooden corvettes, the *Donau*, *Erzherzog Friedrich*, *Dandolo* and *Saida*. It is not expected that *Dreadnought* "VII" can be begun at Fiume this year, and therefore the sum of 5,000,000 crowns which has been voted for her will be devoted to the other new constructions. The first *Dreadnought* receives, as her initial instalment, 19,000,000 crowns, the second 16,000,000, and the two others 5,000,000 each. The three cruisers are designated "G," "H," and "J." The two first mentioned received 3,000,000 crowns each as first instalments, and the last 2,000,000. There are also six 800-ton destroyers, 12 seagoing boats, and six submersibles. To complete the program some other vessels will

have to be laid down. A period of supersession has been adopted under the programe—for battleships 20 years, cruisers and destroyers 15 years, and torpedo-boats 12 years. It is expected that the three small cruisers will be built at the Danubius yard, and one of them probably at the new "Canterie Triestino" at Monfalcone.

The *Viribus Unitis* will be launched at the Stabilimento Tecnico, Trieste, on June 24. The keel was laid on July 23, 1910, and the work of construction has proceeded very rapidly. The *Armeeblatt* of Vienna states that the length of the water-line will be 492 feet, the extreme beam 88 feet, 6 inches, and the mean draft a little over 27 feet. The displacement in round figures, will be 20,000 tons. This ship will carry twelve 45 caliber 12-inch guns in four triple turrets on the middle line, twelve 5.9-inch 45 caliber, eighteen 2.7-inch, and six smaller guns. Three turbine engines, with an aggregate of 25,000 horse-power, are to give a minimum speed of 20 knots. Electricity will be used for many purposes on board, current being supplied by four turbo-dynamos, each of 300 kilowatts, and a Diesel dynamo of 75 kilowatts. The ship will have an installation of 11 searchlights. There will be 22 boats of various types, including two motor and one large steam boat. Great attention has been paid to hygienic conditions and refrigeration of magazines. In relation to the name of the vessel, *Danzer's Armee Zeitung* makes a curious remark. It sneers at other papers for asserting that the name of *Kaiser Franz Josef* or *Tegetthoff* would be given to the ship, and compares the name of *Viribus Unitis* to that of the Italian *Dante Alighièri.* The latter, it says, seems poetical, and is as if the Germans had called the *Nassau* by the name of Goethe or Schiller, or the Austrians their first *Dreadnought* by that of the national poet Grillparzer. But look a little deeper. Dante is not a dead poet, but a living inspirer of the clubs, societies, and individuals who are enemies of Austria and exponents of the claims of "Italia irredenta!"—*Army and Navy Gazette.*

According to the *Moniteur de la Flotte* the *full load* displacement of the *Viribus Unitis* will be 22,000 tons (her normal displacement being 20,000), and her cost is as follows:

	Francs.
Hull complete	16,275,000
Armor	13,020,000
Propelling machinery	7,350,000
Electrical apparatus	1,995,000
Artillery	13,513,500
Munitions	10,710,000
Other supplies	766,500
Total	63,630,000

Much of the material for a third *Dreadnought,* to be built on the same slip as soon as the *Viribus Unitis* is launched, has already been collected.

According to some rough sketches of the two battleships building at Trieste, the triple-turret system is not their only claim to distinction. Each of the four turrets will have a remarkably comprehensive arc of fire well over 300°.

THE NAVAL PROGRAM.—It appears now to be certain that the Dual Monarchy has actually entered upon a considerable program, which will ultimately change the situation in the Mediterranean. There are to be 16 battleships, including the new *Dreadnoughts,* and the supersession of the older vessels will take place much on the German system, although Admiral Montecuccoli does not believe that *Dreadnoughts* are likely to become rapidly obsolete. He told the representatives at Budapest that

even a little war is dearer than a big fleet, and that the country has hitherto spent very little on her navy. The total estimates, which have hitherto been £2,000,000, are expected to remain at £5,200,000 yearly up to 1914, when they will rise to more than £6,000,000. Probably all citizens of the Dual Monarchy know what to expect after that date in greater financial burdens. In 1916 the *personnel* will number 17,000, but will be subsequently increased to 20,000 or 21,000.—*Army and Navy Gazette.*

BRAZIL.

The construction of the 32,000-ton Brazilian battleship recently ordered in Great Britain is stated to be temporarily suspended, as are also the preliminary requests for tenders for further torpedo craft, pending the settlement of important questions relating to naval policy at Rio de Janeiro. Instead of the 32,000-ton ship it is believed to be probable that, as originally arranged, a third *Minas Geraes* will be built, as well as an additional scout of the *Bahia* type.—*The Engineer.*

The floating dock *Alfonso Penna,* built by Vickers for the Brazilian Government, and recently delivered at Rio de Janeiro, has successfully docked the *Minas Geraes* and *Sao Paulo,* ships of 19,000 tons normal displacement.

CHILI.

An order has been placed with the Electric Boat Company for two submarines which will be built at Seattle for the Chilean Government.

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleship.			
Danton	18,350	Brest.	Under trial.
Mirabeau	18,350	Lorient.	" "
Voltaire	18,350	Bordeaux.	" "
Diderot	18,350	St. Nazaire.	" "
Condorcet	18,350	"	" "
Vergniaud	18,350	La Seyne.	" "
Courbet	23,500	Lorient.	Building.
Jean Bart	23,500	Brest	"
France	23,500	St. Nazaire.	Authorized.
Paris	23,500	La Seyne.	"

The six battleships of *Danton* class are now all under trial, and the first division, comprising the *Danton, Diderot* and *Condorcet,* will be commissioned for active service before the summer is over. The second division, *Mirabeau, Voltaire* and *Vergniaud,* will probably be completed and join the fleet late in the autumn. The characteristics of these ships are as follows: Length 145 m., beam 25.65 m., displacement 18,350 tons; four 12-inch, twelve 9.5-inch and sixteen 3-inch guns; two under-water torpedo-tubes; 19.25 knots.

THE NEW BATTLESHIPS.—*La France* and *Le Paris* will be the names of the French *Dreadnoughts* recently voted by the Senate. The foolish plan of naming warships after politicians, philosophers, essayists, and writers or thinkers of like classes has been abandoned, and the first two ships of the new program have the names of good seamen—*Jean Bart* and *Courbet.* Now the country and its capital are to have a turn. The proposal was not voted by the Senate without some discussion. The Senate Navy Committee, supported by M. Leboucq, the reporter on the estimates, and M.

Justin Godart, inserted a clause, strongly resisted by Admiral Bienaimé, which may lead to difficulty. No contract is to be given to any company or firm which has at its head, or as a member of its board, one or more members of the Chamber of Deputies or the Senate. This was carried by 329 votes against 139. The object is praiseworthy, but it is conceivable that some companies may be placed in a difficulty by the restrictions.

Admiral de Lapeyrère announced that the new vessels would be similar in every detail to the *Courbet* type, designed in 1909. Their armament of 12 guns of 305 mil. (45 caliber length), in six twin turrets disposed crossways so as to give a fire of 10 guns abeam and 8 axially, was in his opinion sufficient, together with the thick (270 mil.) and wide belt provided, and the expected trial speed of 21 knots, to enable them to hold their own against the most powerful battleships yet designed, and notably against the British *Orion* type, actually the strongest afloat. This assertion, however, loses much of its value when it is remembered that the designs of new ships, armed with 340 mil. weapons (analogous to those of the *Orion*), have been completed by the Section Technique, discussed by the Conseil Superieur, and postponed in construction until next year, merely through the unpreparedness of the Naval Ordnance Department. This much had to be confessed by the Minister of Marine, who declared he could not see his way to order the 340 mil. guns before exhaustive experiments had been made with the trial weapons of that type now being manufactured at the Ruelle artillery works, an event that could not take place before July.

A writer in the *Yacht* discusses the organization of divisions in the French Navy. Should they comprise four vessels or only three? Up to the present time the French Navy has adopted a unit of three, and squadrons have comprised six or nine battleships. There are the three *Charlemagnes*, the six *Patries*, and the six *Dantons*. By this arrangement homogeneity has been attained, and some deputies have criticized the new program because it begins by the building of four battleships all identical, being the *Jean Bart*, *Courbet*, *France* and *Paris*. It is proposed to constitute divisions henceforth comprising four ships. It was thought, when Admiral Fournier tried his system of tactics about the year 1895, a new consecration had been given to the three-ship unit. Other nations have not any regulation concerning the number of ships in a division, but in practice in the British Navy and the navies of the United States, Italy and Japan the division usually consists of four vessels. The writer insists that the question is one of great tactical importance, and that it cannot be lightly dismissed. He argues that the four-ship plan is the best, and that the construction must be directed to the creation of divisions of this strength.

THE DANTON CLASS.—These vessels belong to the 1906-1907 program and were designed by Monsieur l'Homme. Their main armament consists of four 12-inch and twelve 9.5-inch guns. The former are mounted in pairs fore and aft, and the latter, also in pairs, three pairs on each side. The broadside fire is therefore four 12-inch guns and six 9.5-inch guns, while both ahead and astern two 12-inch and four 9.5-inch guns can be fired. There are, in addition, sixteen 12-pounder and ten 3-pounder guns, as well as two 18-inch submerged torpedo tubes. The designed overall length of these vessels is 480 feet, their beam 88 feet 9 inches, and their maximum draft 27 feet 6 inches. The displacement is given as 18,400 tons. The propelling machinery is composed of turbines of the Parsons type, with a designed horse-power of 22,500. This, it was anticipated, would give a speed of 19.4 knots. Two of this class have recently been undergoing trials. These are the *Danton* and the *Diderot*. We are enabled to give in the tables below some of the figures relating to these trials.

Ten Hours' Full-speed Trial.

	Danton.
Date	24th March
Boiler pressure, lb. per sq. in.	224.46
Pressure at high-pressure turbine, lb. per sq. in.	216.22
Vacuum at condenser, inches	28.80
Revolutions per minute	296
Mean speed, knots	19.44
Coal consumption per mile, lb.	2069.55
Coal consumption per sq. ft. of grate, lb.	25.71

Three Hours' Full-speed Trial with Three-quarters of Boilers

Date	28th March
Pressure at boilers, lb. per sq. in.	236.13
Pressure at high-pressure turbine, lb. per sq. in.	230.72
Vacuum at condensers, inches	29.05
Revolutions per minute	316.7
Mean speed, knots	20.18
Best run	....
Coal consumption per mile, lb.	2561
Coal consumption per sq. ft. of grate, lb.	34.6

Tyenty-four Hours' Trial without Forced Draught.

Date	31st March
Revolutions per minute	292.18
Mean speed, knots	18.16
Coal consumption per mile, lb.	1466
Coal consumption per sq. ft. of grate, lb.	17.17

Eight Hours' Trial: (1) *With Half of Boilers;* (2) *With a Fe*

(1) Date	6th April
Mean speed, knots	14.05
Coal consumption per mile, lb.	....
(2) Date	
Mean speed, knots	....
Coal consumption per mile, lb.	....

The figures regarding the actual horse-power developed a present in our possession, but it will be seen that the designed exceeded. It may be added that the *Danton* is fitted with Bellev and the *Diderot* with Niclausse boilers. The *Danton* was buil and engined by the Forges et Chantiers de la Méditerranée while the *Diderot* was built and engined by the St. Nazaire : *Diderot* experienced very bad weather during her trials.—*The*

THE DISTRIBUTION OF THE FLEET.—The old question of the tion of the French fleet is coming up afresh with the entry into the ships of the *Danton* class. Is it wise to divide the fleet into one in the North and the other in the Mediterranean? Shoulc bined fleet have its base at Brest or Toulon? In the *Moniteur d* it is pointed out that the *Dantons* bring a new element into th It was said, when the fleet was divided by the late Ministe principle of concentration had been abandoned. But was it j contemplate the concentration of two forces so different in The situation will be changed with the commissioning of the and the combined fleet in the Mediterranean would give to Fra superior to the combined forces of Austria and Italy, althougl lack scouts. As the writer in the *Moniteur* points out, the l

the fleet is really a political question, which only the government can properly appreciate. But it is shown that if the concentration is in the North, the only adversary contemplated can be Germany, and in that case every ship must be there which possesses any fighting value. The result would be the abandonment of the Mediterranean. In any case the writer says that there must be in the North a covering squadron and a strong base at Brest. When the four *Jean Barts* are completed, the Mediterranean squadron could be strengthened, and the covering squadron could receive the four ships of the *Justice* class.—*Army and Navy Gazette.*

BRITISH AND FOREIGN SUBMARINES.—Large as are the new British submarines, they do not come up to the latest French vessels in point of displacement. The *Mariotte*, which was launched at Cherbourg on February 2, is credited with a displacement of 1100 tons, and her length is given as 214 feet, as compared with the 176 feet of the "E" class to be laid down at Chatham. The *Mariotte* is the vessel which the French claimed to be the largest submarine in the world, and, as far as present information goes, the claim is not disproved. It is, however, nothing new to find France taking the lead in this way, for the predecessors of the *Mariotte*, the *Archimede* and her sisters, were the largest submarines afloat when they were launched in 1909, their displacement when submerged being 810 tons, and it must be remembered that the French were the pioneers of submarine navigation with the *Gymnôte* of 1888. The latest American submarines ordered will have a displacement of between 450 and 500 tons, and the latter figure is also that of the new Russian submarines, but Italy, which has built some very successful submarines during recent years, prefers smaller boats of about 225 tons' displacement.—*Army and Navy Gazette.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Ost Friesland	19,000	Wilhelmshaven.	Launched Sept. 30, 1909.
Thüringen	19,000	Bremen (Weser Yard).	Under trial.
Helgoland	19,000	Kiel (Howaldt).	Launched Sept. 26, 1909.
Oldenburg	19,000	Danzig (Schichau).	" June 30, 1910.
Kaiser	20,000	Kiel (Kaiserliche W.).	" Mar. 22, 1911.
Frederick the Great.	20,000	Hamburg (Vulkan).	" June 10, 1911.
Ersatz Hagen	20,000	Kiel (Howaldt).	Building.
" Aegir	20,000	Danzig (Schichau).	"
" Odin	21,000?	Germania Works.	"
" K. Friedrich Wilhelm		....	Authorized.
" Weissenburg		....	"
" S		Wilhelmshaven.	"
Armored Cruisers.			
Moltke	21,500?	Hamburg (Blohm and Voss).	Launched April 7, 1910.
Goeben	21,500?	"	" Mar. 30, 1911.
J	21,500?	"	Building
K		....	Authorized.
Protected Cruisers.			
Breslau	4,500 ?	Stettin (Vulkan).	Launched May 16, 1911.
Magdeburg	4,500 ?	Bremen (Weser).	" May 13, 1911.
Ersatz Cormoran	4,500 ?	Bremen (Weser).	Building.
" Condor	4,500 ?	Wilhelmshaven.	"
" Seeadler	.....	....	Authorized.
" Geier	.....	....	"

THE FREDERICK THE GREAT.—The *Ersatz Heimdall* was launched at Hamburg on June 10 and named *Frederick the Great.* The dedicatory address was delivered by General von der Goltz, who recommended to the fleet as a motto an adaptation of *Frederick the Great's* phrase: "The Prussian cavalry always attacks first," and called attention to the growing importance of oversea affairs, saying:

"We must make our name honored and respected not only among our neighbors, but also far beyond the ocean."

In the course of a technical conference at Dantzig, Rear-Admiral Holzhauer stated that the four battleships of *Helgoland* class were armed with twelve 12-inch 45-caliber guns, twelve 6-inch and sixteen 3.5-inch. Their main armor belts are 11 inches thick, tapering to 5 inches at the ends. This is the first authentic information concerning the batteries of these ships. A strike at the Schichau works at Dantzig will delay the completion of the *Oldenburg* and the *Ersatz Aegir.*—*Moniteur de La Flotte.*

THE "KAISER."—The battleship *Kaiser* was launched from the Imperial dock yard at Kiel on March 22. A salute of twenty-one guns was fired as the *Kaiser* took the water.

The following was the Imperial Chancellor's baptismal speech: "By your Majesty's command the ship which awaits its launch to-day, the birthday of William I, will be named the *Kaiser*. Kaiser! The word is steeped in dreams of German greatness and the German longing for a Kaiser. Loyalty to the Emperor in the hearts of thy seamen will be the compass whereby thou wilt steer. If God, who rules the wind and waves, and decides the fate of battles, lead thee into danger and distress, may thy crew in the last hour be mindful of the name thou bearest. In the gray dawn of our history the voice of their women roused the manhood and courage of our fathers; so may good fortune and a blessing from thy heart and the heart of the Empress, who now baptizes thee, attend thee on all thy voyages."

The Empress broke a bottle of German champagne over the ship's bows, saying: "By command of the Emperor, I baptize thee *Kaiser.*"

The *Kaiser* is the first turbine battleship in the German Navy, and also the first of the ships of the super-*Dreadnought* division of the new fleet. The first division comprises eight *Dreadnoughts,* all afloat. The last launched was the *Oldenburg,* on June 30.—*Naval and Military Record.*

THE "GOEBEN."—The armored cruiser "H," built by Messrs. Blohm and Voss at Hamburg, was launched on March 30 and received the name of *Goeben.* Hitherto all the battleships have received territorial titles, taking their names from the kingdoms, states, and principalities of the Empire, and the list was getting exhausted. The names of some of the older battleships will now, however, become available. The ship to which the name of *Kaiser* has been given—and she is not the first to bear it—resembles in general characteristics the *Nassau* class, but she has greater displacement, and is reported to mount 12-inch guns instead of the 11-inch. The one fact definitely known is that these are arranged on the same plan as in the first *Dreadnoughts*—that is, with two twin barbettes severally forward and abaft, and two other twin barbettes on either broadside. The battle-cruiser is of the *Von der Tann* class, and probably does not differ much from her original, except in carrying the heavier gun. Like all the armored cruisers and battle-cruisers, she bears the name of a great soldier, for it will be remembered that Goeben was an officer who took a distinguished part in the Franco-German War.—*Army and Navy Gazette.*

According to *Le Yacht* the armored cruisers "H" and "J" are of 21,800 tons normal displacement (1000 tons of coal); carry eight 12-inch and ten 6.7-inch guns, besides fourteen 3.5-inch; have 4 under-water torpedo-tubes; and a main armor belt of 7.5 inches maximum thickness.

All the new armored ships are being fitted with torpedo-defence nets.

With only a couple of months to elapse before the *Thüringen* is completed for service, we are still without clear and authentic details of this battleship, and the fact speaks volumes for the system of secrecy maintained by the marine office in regard to new construction. It is to be doubted whether German Navy men themselves, apart from high departmental officials, are in possession of the particulars. Ever since the keelplate of the *Thüringen* was laid at Bremen elaborate precautions have been taken to prevent any leakage of information, and the same conditions prevail at Kiel and Wilhelmshaven, where the *Helgoland* and *Ost-Friesland* are completing. The first official description of the new units is due to appear in *Nauticus*, published in June, but meanwhile the essential details, given below, are accepted as accurate. The cruiser *Moltke*, another "dark horse," will probably commence her trials in June. The following particulars refer to the battleships *Thüringen*, *Helgoland* and *Ost-Friesland:*

Displacement, 21,300 tons. Guns, twelve 12-inch 45-caliber, mounted in six turrets and disposed as in the *Nassau;* twelve 6.7-inch 50-caliber, in 7-inch armored battery; twenty 3.4-inch, improved model, disposition uncertain. Six submerged tubes, arranged as in *Nassau*, but fixed. Main armor belt 10 feet wide, 11 inches thick amidships, 5-inch ends. General appearance like *Nassau*, but funnels more squat. Arcs of fire for bow and stern turrets, 280°.

Less is known about the cruiser *Moltke*, save that her armament consists of eight 12-inch 45-caliber, and ten 6.7-inch guns. The big gun disposition corresponds exactly to that of the *Von der Tann*, while of the secondary armament two guns appear to be sponsoned forward and two aft. Another interesting report is to the effect that the two small cruisers of last year's program, the *Ersatz Cormoran* and *Condor*, are to differ in armament from their predecessors, and will carry at least two 17-cm., or 6.7-inch guns, in addition to ten 4-inch. Some such development was anticipated in view of the relatively heavy armament now mounted on the latest British "Town" cruisers, compared with which contemporary German boats make but a poor showing.—*Naval and Military Record.*

OIL ENGINES.—It has latterly been stated in various papers that an extensive equipment of oil engines would shortly be made in one of the new German battleships. The ship in question is the *Ersatz Odin*, which is being built in a private yard at Kiel, and the engines are being built at Nüremberg. They will supply one-third of the power for the ship, driving the middle screw, while the others will be driven by the existing type of engines.—*Army and Navy Gazette.*

WIRELESS TELEGRAPHY.—The Kiel correspondent of the *Kölnische Zeitung* states that a considerable development of the wireless telegraph system on the German coasts is taking place. There are new stations on both the North Sea and the Baltic, and the communications are now nearly complete. There are new stations at Swinemünde, Königsberg, at Tönnies at the mouth of the Eider, and at Sylt, so that the system now extends, or will shortly extend, from Borkum to the Russian frontier. Several stations have been improved. The new Naval School at Flensburg, where now midshipmen receive their education instead of at Kiel, has a station of its own.—*Army and Navy Gazette.*

THE NAVAL DEBATE.—The debate in the Reichstag on the second reading of the navy estimates of 1911 has not afforded much material for excited discussion. There have been the usual questions and answers, and Grand Admiral von Tirpitz has capably defended his administration. Having been concerned with the existing navy law from the beginning, he has every right to be satisfied with what has been achieved. One speaker said the increase of the fleet had been conducted on a highly economical basis, and that the material value largely exceeded the total

outlay. He added that he hoped the "old tale of a German invasion of England" was now done with, and the Grand Admiral declared once more that the navy had no aggressive purpose, but must be such a force that "any other great power would be running a risk if it attacked Germany." He also expressed very reasonable astonishment at statements made in England as to accelerated construction outside the provisions of the navy law. That there has been no such acceleration is now generally recognized in England, and everything depends, as the minister said, upon the voting of money by the Reichstag.—*Army and Navy Gazette.*

During the recent discussion in the Reichstag on the German naval estimates Admiral von Tirpitz said that he could not but fully endorse Herr Schrader's statement that it was an extraordinary mistake in England to suppose that Germany had hastened the construction of her fleet in excess of the naval law and its provisions. How was that alleged acceleration in building possible when the House had not given its assent to it, and they had not had a single pfennig for that purpose? For this reason alone such secret acceleration would have been impossible.

In an article in the *Deutsche Tageszeitung* Count Reventlow, the interpretative spirit of the German Navy League, says the government and taxpayers of Great Britain should draw the conclusion from the words of the German Secretary of State that the continuance of the increase of armament in England beyond a certain limit must have the inevitable and absolutely necessary consequence that Germany will increase her naval armament, and beyond the scope, too, of her existing navy act.

The qualities of recent German ships are discussed at length in a recent issue of the *Glasgow Herald* by M. I. N. A., who points out that, according to some critics, Germany's answer to our *Dreadnoughts* is a most ineffective one. The *Nassau*, the *Westfalen*, the *Rheinland*, and the *Posen* now in commission, draw from two to four feet more than was designed but some of this has been remedied by the drastic removal of internal weights and the reduction of coal carried. Mr. F. T. Jane described them recently as "a species of nautical indigestion."

Discussing the details of the more powerful *Ost-Friesland* class, of which four—the *Ost-Friesland*, the *Helgoland*, the *Thüringen*, and the *Oldenburg*—have been launched and five are on the stocks, M. I. N. A. calls attention to the fact that the armor is only 9¾ inches thick, as compared with the 12-inch armor of the British contemporary vessels. The estimated cost of each ship is £2,100,000, whilst the British *Neptune*, at least as powerful a vessel, was built for £400,000 less.—*Page's Weekly.*

The German Admiralty has ordered two Curtiss biplanes from Mr. G. H. Curtiss, the United States aeronaut, who was recently so successful in rising from the water and descending on the deck of a warship. It is understood that Mr. Curtiss has been invited to Kiel during the coming summer, in order to give exhibitions with one of his machines.—*The Engineer.*

With the rise of German territorial aspirations in the Far East her cruising squadron has been gradually reorganized and transferred to Chinese waters, Tsingtau, which is situated in Kiauchau Bay, the magnificent harbor on the Shantung Coast, permanently leased from the Chinese Government, being its headquarters. Since its acquisition, the Germans have spared neither pains nor money in converting it into a powerful naval base. Tsingtau, which is the seat of government, was, when the bay was first occupied in 1898, nothing but a poor fishing village, but it is now being rapidly transformed into a fine modern city. Wide streets have been made, good houses and hotels, factories, etc., have sprung up, and magnificent stone quays, alongside which large steamers can conveniently lie, have been constructed; while the railway communication

he interior has been energetically developed. A floating dock, 410 length, 98 feet wide at the entrance, with a depth of 36 feet on , has been constructed and sent out; it is capable of lifting a ship r 16,000 tons. Telegraph cables are laid to Shanghai and Chifu, addition to telegraphic there is also a complete system of tele- communication between the town and the principal German posts interior. A considerable foreign trade has sprung up, and there are our large shipping companies, including the Hamburg-American, un steamers regularly every few days. The Kiauchau Protectorate inistered by Admiral Truppel, who has held the position of gov- and commander-in-chief of the occupying forces for many years and se energy and careful administration the rapidly growing prosperity port and surrounding territory is mainly due.—*United Service ine.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
s	20,250	Scotts (Greenock).	Under trial.
s	20,250	Palmer's (Jarrow).	" "
	22,500	Portsmouth.	Launched Aug. 20, 1910.
n	22,500	Armstrong.	" Mar. 30, 1911.
ror	22,500	Beardmore.	" May 1, 1911.
rer	22,500	London (Thames Iron Works).	" Feb. 1, 1911.
	23,500	Scotts (Greenock).	Building.
us	23,500	Cammell, Laird & Co.	"
on	23,500	Devonport.	"
eorge V	23,500	Portsmouth	"
ored Cruisers.			
	26,350	Devonport.	Launched Aug. 6, 1910.
s Royal	26,350	Vickers.	" Apr. 29, 1911.
ia	18,800	Brown & Co.	Building.
land	18,800	Fairfield.	"
Mary	26,350	Palmer (Jarrow).	"
Cruisers.			
	3,400	Pembroke.	Under trial.
	3,400	"	Launched Mar. 14, 1911.
n	3,400	"	Building.
uth	5,250	Vickers.	Launched Feb. 14, 1911.
th	5,250	Beardmore.	" Sept. 20, 1910.
uth	5,250	Armstrong.	" Nov. 18, 1910.
th	5,250	London & Glasgow Co.	" Apr. 12, 1911.
npton	5,400	Brown & Co.	Building.
	5,400	Beardmore.	"
	5,400	London & Glasgow Co.	"
n	5,400	Chatham.	"
rne	5,400	Cammell, Laird & Co.	"

ACTS FROM THE FIRST LORD'S EXPLANATORY STATEMENT.—The esti- for 1911-12 amount to £44,392,500, as compared with £40,603,700 for rent year.

principal increases occur under the heads of Pay of Personnel I), Victualling and Clothing (Vote II), Shipbuilding (Vote VIII), val Armaments (Vote IX).

numbers required for manning the fleet are 3000 more than were for in the estimates for the current year. This increase is due to the requirements of new ships now being placed in commission der construction.

The shipbuilding and armament votes (VIII and IX) together show very large total, caused mainly by the amount required to complete th old programs already approved by Parliament. The increase over la year is three and a quarter millions.

Vote X shows an increase of £70,000. The important new works : Rosyth and Portsmouth have reached a stage of development at which th contractors must earn larger sums if they are to complete them withi the contract time. No new works of great magnitude are proposed fo the coming year, but a second dock has been ordered at Rosyth.

Shipbuilding.—New construction will cost £15,063,877, as aginst £13,-279,830 for 1910-11. Of this amount £13,325,232 will be spent on the continuation of work on the ships already under construction, and £1,738,645 for beginning work on ships of the new program, which is composed as follows:

5 large armored ships, 3 protected cruisers, 1 unarmored cruiser, 20 destroyers, 6 submarines, 2 river gunboats, a depôt ship for destroyers and a hospital ship.

Works.—During the last year the main works of Simon's Bay Dock yard have been completed.

At Plymouth the whole of the works in connection with the Keyhan Dockyard extension are practically finished, whilst at Portsmouth the nev lock and dock are progressing satisfactorily.

Good progress is also being made with the naval base at Rosyth.

Royal Marines.—The numbers borne on March 31, 1911, will be abou 15,800. There will also be about 1300 band ranks afloat and under training

The number of re-engaged men now serving to complete time for pensio is 4115, as compared with 3792 last year.

The numbers of royal marines qualified in the higher gunnery rating are as follows:

Gunlayers, 1st class	75
Gunlayers, 2d class	358
Gunlayers, 3d class	496

A new warrant rank for the royal marines has been created with th title of Gunnery Sergeant Major, R. M. Twenty of these warrant office will be created, and candidates for the rank have been selected, and a at present undergoing a qualifying course. These officers will serve mai afloat, and their duties will be analogous to those of gunners, R. N., wi whom they will rank; they will also receive the same pay.

NAVY ESTIMATES.— The navy estimates have been passed with le excitement than in recent years. They may be described as moderat neither large enough to satisfy the big navy man, nor small enough satisfy the labor members. The principal item is five first-class ships, a in this respect, at least, the Cawdor memorandum has been followed. No of these ships will be actually laid down this year. Of secondary vess there are four cruisers, three protected and one unarmored; twenty d stroyers and half-a-dozen submarines. On this new program about o and three-quarter million pounds will be spent before next April, whi thirteen and one-third millions will go on the continuation of ships alrea in hand. The remaining millions which make up the total to £44,392,5 or three and a quarter millions more than last year, will be spent on th usual navy requirements and on works, amongst which the harbor a Rosyth and the lock and dock at Portsmouth may be particularly men tioned, as they will involve heavy expenditure this year if they are to b completed in contract time. There is not a word in the estimates abo the fitting of oil or gas engines to battleships, cruisers, destroyers, or a fighting vessels, so that the usual crop of rumors which may be expect with the dog-days should be received with caution.—*The Engineer.*

THE "MONARCH."—Complete success attended the launch of the battleship *Monarch* from the Elswick shipyard on March 30. This vessel is the second of the four "contingent" ships of the 1909-10 program to take the water, the others being the *Thunderer*, the *Conqueror*, and the *Princess Royal*. The keel of the *Monarch* was laid on April 1 of last year, and good progress was made in her construction until the trouble arose with the workmen, resulting in the lock-out. This was on September 3, or five months after the laying of the keel. At this time the weight on the blocks was considerably over 5000 tons, the weight worked in during this period averaging over 1000 tons per month. The lock-out extended over a period of fifteen weeks, during which time the work on the *Monarch* was entirely at a standstill; but upon the men returning to work on December 15, rapid progress in her construction was again resumed.

The *Monarch* has been built under the usual veil of secrecy; it may, however, be taken that she has a length over all of 581 feet and a breadth of 88 feet 6 inches. The main armament will consist of ten 13.5-inch guns, capable of throwing a projectile of about 1250-pound weight. The secondary armament consists of twenty-four 4-inch guns, and there are also three 21-inch torpedo tubes. The designed speed of the *Monarch* is 21 knots, with a horse-power of 27,000. The turbines are of the usual Parsons type, with the cruising system incorporated with the high-pressure turbine, as has been adopted in all the later battleships of the *Dreadnought* type. Steam will be supplied by Babcock and Wilcox water-tube boilers. The maximum coal-carrying capacity will be 2700 tons, and in addition there will be accommodation for 1000 tons of oil fuel. A belt of 12-inch thickness extends fore and aft about 400 feet, and is continued to the extremities by thinner plating. Above this is a belt of 9 inches, and there are armored bulkheads where the thinner plating ends and a protective deck above the belts. It is understood that the *Monarch* will, like the other battleships of her class, have armored control positions as an alternative to the control position on her tripod mast, and that the turret armor will be 10 inches in thickness.—*The Engineer.*

The completion of the tests of the gun mountings of the *Colossus*, manufactured by the Vickers Company, terminates the trials of that vessel and the *Hercules*, both of which promise to be ready for commission well within a period of two years from the laying of the keel. The *Colossus* was built and engined by Scotts', of Greenock, and the *Hercules* by Palmers', of Jarrow-on-Tyne. Both ships were ordered early in the financial year 1909-10 and are the last of the battleships to have 12-inch guns, all subsequent capital ships having 13.5-inch guns in the primary battery. The keels were laid in July, 1909, and the ships can, if desired, be ready for the naval review. Their speed is 21 knots, with the turbine machinery developing 25,000 shaft horse-power. The *Colossus* on her eight hours' full-power trial developed 29,000 shaft horse-power with the steam pressure at the turbines averaging 170 pounds and the vacuum in the condenser 28½ inches, which is exceptionally favorable. The speed realized was just over 21.5 knots. This was the speed also achieved by the *Hercules*, which is in every respect a sister ship, all the parts of the machinery being made to a common standard to both ships. The power in the *Hercules* was 28,700 shaft horse-power with the turbines running at a mean of 335 revolutions per minute.—*United Service Gazette.*

THE "YARMOUTH."—H. M. S. *Yarmouth*, a protected cruiser of the "improved *Bristol*" class, was launched on April 12 from the works of the London and Glasgow Shipbuilding and Engineering Company, Govan. The *Yarmouth* is a sister ship to the *Falmouth*, the *Dartmouth*, and the *Weymouth*. These ships, while of the same length, differ from their predecessors of the *Bristol* class in respect of greater beam, displacement, and fighting power. The *Yarmouth* partakes more of the character of the

Bristol than her sister ships, in that her propelling machinery will be turbines of the Brown-Curtis type, which proved so sucessful in the *Bristol* and which have been made by the same firm, John Brown & Co., Limited, Clydebank. The *Yarmouth* will, like the *Bristol,* be propelled by twin screws instead of by four lines of shafting and propellers as in the sister ships which are fitted with Parsons turbines.

For protection the *Yarmouth* has a curved armored deck of nickel-steel, coal bunker protection for machinery, and extensive sub-division by bulkheads. There is a long raised forecastle which will enable the vessel to keep the sea in all weathers. The uniformity of armament in the *Yarmouth* marks a great advance in second-class cruiser construction; with their great speed and fair fighting qualities, the type to which the new ship belongs are well fitted to act as scouts for the fleet and convoys to merchant ships.

While the designed speed is the same in all the ships, the maximum in the *Yarmouth* will, it is anticipated, be attained more economically. The revolutions of the propellers are considerably less with the Brown-Curtis type of turbine than with the Parsons type, and in this way increased screw efficiency should be obtained. That such increase is not obtained at the expense of efficiency in the turbine was clearly demonstrated in the *Bristol* by the highly successful results of the steam, water, and coal consumption trials.

The following are figures of comparison as to dimensions, power and armament between the *Yarmouth* and the *Bristol*:

	Bristol.	*Yarmouth.*
Length on water-line	450 feet	450 feet
Beam	47 feet	48½ feet
Draft	15½ feet	15½ feet
Displacement	4820 tons	5250 tons
Designed S. H. P.	22,000	22,000
Designed speed	25 knots	25 knots
Armament	2 6-inch Q. F.	8 6-inch Q. F.
	10 4-inch Q. F.	4 3-pdr. Q. F.
Torpedo tubes	2	2
Coal capacity	800 tons	1000 tons
Complement	376	380

—*The Engineer.*

THE "PRINCESS ROYAL."—The armored cruiser *Princess Royal* was launched at the Barrow shipyard of the Vickers Company on April 29. Ten years ago the heaviest completed cruiser in the navy protected by vertical side armor was the *Sutlej,* of 12,000 tons, and the heaviest completed cruiser protected by sloping deck armor was the *Terrible,* of 14,200 tons. The heaviest guns carried by these vessels were of of 9.2-inch caliber, and each mounted two of these guns in barbettes protected with 6-inch armor. Each ship also carried a number of 6-inch guns similarly protected. The nominal speed of these ships was between 21 and 22 knots. The *Princess Royal* will, however, have a displacement of 26,360 tons, and her heaviest guns are of 13.5-inch caliber, of which she will carry eight behind 9-inch armor of much greater resisting power. The contract speed is 28 knots.

In regard to the gun power of the *Princess Royal,* not only will the armament consist of eight 13.5-inch guns, but these will be disposed in pairs in four gun-houses on the center line, arranged in such a manner as to give a fire of four guns right ahead and eight on either beam. The 13.5-inch gun is nine tons heavier than the 12-inch gun of 50 calibers. But the muzzle energy has been increased from about 50,000 to 60,000 foot-tons. Similarly the muzzle velocity and the trajectory are such as will ensure equal accuracy and no practical diminution in the danger space. At the same time, the increase in the weight of projectile, with its larger bursting charge, promises a much more destructive effect on perforation. So far as rapidity of fire is concerned, it is interesting to note that, whereas

with the old 13.5-inch guns mounted in the *Royal Sovereign* one round could be fired in two and a half minutes, one round from the gun to be mounted in the *Princess Royal* can be fired in 30 seconds, or in one-fifth of the time. This is due to improvements in the breech mechanism and the mounting of the gun. The *Princess Royal* will also carry sixteen 4-inch guns and the largest and speediest long range torpedoes.

For armored protection, the new cruiser will have a belt extending from the upper deck to about 7 feet below the load water-line, and for nearly the whole length of the ship, with a maximum thickness of 9 inches. The armor for this belt and that on the gun-houses, of the same thickness, is of an improved quality, the result of a process devised by English makers, with 25 per cent more resisting power than the armor used upon the earlier cruisers. On the side above the belt the armor is of 6-inch thickness, and in addition to a deck of 3-inch armor the ends of the vessel are protected by bulkheads, while the internal division of the ship is carried out to a greater extent than was formerly the case. Each of the gun-houses with its ordnance, mounting and armor weighs about 630 tons. The sister ships of the *Princess Royal* are the *Lion* and the *Queen Mary*. The *Princess Royal*, which will have a length of 660 feet and a beam of 88½ feet, is to be completed by March 31, 1912.—*United Service Gazette.*

THE "CONQUEROR."—H. M. S. *Conqueror*, one of the three contingent battleships ordered in December, 1909, was launched on May 1 from Messrs. William Beardmore and Co.'s naval construction works at Dalmuir-on-Clyde. The new vessel is 545 feet long and 88.5 feet in beam, and will, when completed, displace 22,680 tons, or 50 per cent more than the battleships of the *Formidable* class (15,000 tons), which were launched ten years ago. Her armament will consist of ten 13.5-inch guns, mounted in five center-line turrets, and twenty-four 4-inch 31-pounder quick-firing guns, grouped in armored positions round the funnel bases. She has three 21-inch torpedo-tubes, firing the new Hardcastle torpedo.—*Page's Weekly.*

By way of contrast with the new *Conqueror*, it may be mentioned that the last *Conqueror* in the navy was launched in 1881, was 270 feet long and displaced 6200 tons, while her armament comprised two 12-inch and four 6-inch guns. Her broadside fire amounted to 1900 pounds of metal, while the new *Conqueror* will fire 12,500 pounds from her big guns and 558 pounds from her 4-inch on the beam. The old ship steamed 14 knots, with engines of 6000 horse-power. The new *Conqueror* is designed for 21 knots, with 27,000 horse-power turbine.

The Admiralty have selected Grimsby as one of the trawler mine-sweeping fleet stations, and on April 2 the enrolment of 300 fishermen will begin. The cruiser *Circe* has been ordered to Grimsby to make arrangements for stationing the parent ship *Jason* and six subsidized trawlers. Upon the latter the men selected will be sent out into the North Sea for special training for a period of 8 to 12 days. Skippers will be given the rank of warrant officer and whilst training will be paid at the rate of 9s. per day, with £4 10s. gratuity upon completion; second hands and engineers, 6s. per day and £3 gratuity; others, 3s. per day and 10s. gratuity. All must be British subjects. Annual retainers will be paid as follows: Skippers, £10; mates and engineers, £8; others, £4. The liability for service is when the naval reserves are called out, and the condition as to death or injury is upon the naval reserve scale.—*United Service Gazette.*

The pair of 12-inch guns, Mark XI, in the fore barbette of the battleship *Vanguard*, refitting at Devonport, have been exchanged for two of the later pattern Mark XII. The latter guns, which are 50 calibers in length, and fitted with improved breech mechanism, will be subjected to a series of experimental tests.

The success which has attended the policy of the British Admiralty in substituting oil fuel for coal has been so great that the government is now asking for tenders for 200,000 tons of oil for use as fuel in the navy. A sum of £45,000 was allotted in the last navy estimates to provide additional storage accommodation for oil fuel for warships at Chatham, while during the last few years oil tanks have been erected at Plymouth and other naval bases. The increase in the use of oil fuel is shown by the fact that the first order last year was for 100,000 tons, which has been doubled in twelve months.

Coaling results of the home fleet at Arosa Bay were: *Dreadnought* received 1018 tons, average 309 tons per hour; *Collingwood* 1050, average 247; *Temeraire* 900, average 235.5; *St. Vincent* 950, average 230; *Natal* 900, average 218.8; *London* 900, average 193.5; *Prince of Wales* 1200, average 189.9; *Venerable* 1000, average 186.8; *Britannia* 800, average 186.6; *Lord Nelson* 950, average 185.4 (swept collier); *Agamemnon* 1100, average 185.3; *Hindustan* 1800, average 184.8; *Formidable* 1000, average 179; *Black Prince* 800, average 165; *Dominion* 800, average 164.5; *Cochrane* 700, average 160.5; *Queen* 808, average 153.9; *Warrior* 1150, average 136.9 (swept collier); *Achilles* 1000, average 122.5 (swept collier); *Glasgow* 650, average 116.4; *Doris* 500, average 101.5; *Duke of Edinburgh* 1300, 98.5 (swept collier); *Bristol* 650, average 88.5; *Gloucester* 500, average 85.9 (swept collier); *Liverpool* 500, average 73.5 (swept collier).—*The Engineer.*

The report which was current about the *Invincible* having buckled while being docked at Portsmouth appears to have had little foundation. It seems that when the *Invincible's* oil tanks were emptied for examination a slight buckling of some of the plates was noticed, probably because of insufficient shoring up when the ship was in dock last. The damage, however, was by no means serious. But in order to prevent anything of the kind in future, special instructions were given in regard to the placing of the shores when the *Invincible* was again taken into dock. The ship had actually entered the dock, although the water had not been pumped out, when it was found that these special instructions had not been complied with, and the cruiser was taken out of dock that the additional shores might be placed in position. This having been done, the *Invincible* again went into dock.—*Army and Navy Gazette.*

The unarmored cruiser *Active,* which was launched at Pembroke dockyard on March 14, is a vessel of 3350 tons, has a length of 405 feet 6 inches, a breadth of 41 feet 6 inches, and a load-water draft of 14 feet. Her armament consists of two 4-inch guns on the forecastle deck and eight 4-inch guns and two torpedo-tubes on the upper deck, with one Maxim gun. The ship is being fitted with turbine machinery by Messrs. R. & W. Hawthorn, Leslie & Co., Limited, of Newcastle-on-Tyne, to give a speed of 25 knots. She will carry a complement of 292 officers and men. The officers' quarters are aft.

An article in the *Times* upon the new submarines of the "E" class shows in a striking manner the rapid development which has been made during the comparatively short time since submarines were introduced into our navy. The progress made can be illustrated by comparing the advances made in other classes; for instance, while the displacement of battleships has increased from 16,350 tons in 1902 to 24,000 tons in 1911, and the size of destroyers from 550 tons to 780 tons during the same period, the submarines have increased in size from the 160 tons of the "A" class to the 800 tons of the "E" boats. Or, to take another illustration, during the thirty years between the laying down of the old *Dreadnought* and the new the displacement tonnage increased from 10,820 to 17,900. Thus while the size of the battleship had not doubled in thirty years, the size of the submarine has increased five times over in a third of

that time. Moreover, the increase is not in size alone, but in every respect, including speed, range of action, and power of armament, advance has been made. Most notable of all, the range of action is now greater than that of very much larger ships. Thus the submarine can unquestionably be used for offensive warfare. Perhaps one of the most suggestive points referred to by the writer in the *Times* is the improvement in the internal combustion engines of the new boats.—*Army and Navy Gazette.*

SUBMARINE SALVAGE LIGHTER.—The salvage lighter for submarines, Yard Craft No. 94, which has been built at Chatham from the designs of Sir P. Watts, Director of Naval Construction, and is fitted with salvage plant capable of lifting a submarine of the "C" class, has been delivered at Sheerness. The lighter is the first built for the salvage of submarines, ordinary lighters having hitherto been used, the craft being designed as a result of the knowledge acquired in the operations for the salvage of submarine "C 11." No. 94 has been built with a length of 115 feet, a breadth of 31 feet, and a displacement at load draft of 790 tons. She is fitted with a 15-inch centrifugal pump, and has four trunkways fitted with capstans for lifting a weight of 300 tons. Her equipment also includes an air-pump for working pneumatic tools, and she is fitted with an electric light installation. No. 94 has cost £26,846, and when not required for service as a salvage vessel she will be used as a steam mooring lighter.—*Army and Navy Gazette.*

On paper the power of the *Indefatigable* is no greater than that of her predecessors of the cruiser-battleship type—that is to say, she has the same number of guns in her battery, which comprises eight 12-inch and sixteen 4-inch. The 12-inch guns, however, are of the new 50-caliber type, having a muzzle energy of 47,700 foot-tons.

The new ship holds the record for cheapness of construction. Hitherto this position has been held by the contract-built battleship *Vanguard*, which cost £1,607,781 for her 19,250 tons, or a rate of £83.52 per ton. The *Vanguard's* speed is only 21 knots, and the fact that the 27-knot *Indefatigable* has been built for £1,547,426—£82.53 for each of her 18,750 tons—is a remarkable testimony to the efficiency of the dockyard at Devonport, where she was built.

The *Indefatigable* is the last of the large armored cruisers to be armed with 12-inch guns. The Colonial cruisers *Australia* and *New Zealand* will have eight of these guns, but the *Lion* and *Princess Royal*, now under construction under the 1909-10 estimates, will carry the new 13.5-inch guns.—*Royal United Service Institution.*

THE AUSTRALIAN FLEET.—The report of Admiral Sir Reginald Henderson, who left England in August last to inspect the naval defences of Australia and advise the Commonwealth government in regard to them, is a very important document, and one which deserves, as it will no doubt receive, the close attention of all British naval men. Only a rough outline of the scheme has yet come to hand, and from this it appears that provision is made for a fleet of eight armored cruisers, ten protected cruisers, eighteen destroyers, and twelve submarines to be constructed by the year 1933. These figures include the ships of the fleet unit now being constructed, and the cost of the forty-eight vessels is placed at £23,500,000, but the total expenditure, including the cost of docks and the provision of two years' stores, will be £40,500,000. When this fleet is provided in twenty-two years' time, the Commonwealth government will be pledged to an annual naval expenditure of £4,794,000. The ultimate *personnel* required will be 15,000 men. In his last report Admiral Henderson says that that primary object of the Australian Navy is to support the Empire's command of the sea, and the secondary object to protect Australian ports and shipping from hostile raids. He proposes that the fleet shall be divided into the Eastern and Western commands, meeting yearly for combined exercises, with Sydney and Fremantle as the chief bases, respectively.

NAVAL QUESTIONS IN PARLIAMENT.—*The cost of Dreadnoughts.*—Mr. Kellaway asked the First Lord of the Admiralty whether his attention had been called to a statement made by the Grand Vizier in the Turkish Parliament that Messrs. Sir G. W. Armstrong, Whitworth & Co., Limited, had tendered for the supply of the hull and engines of two *Dreadnoughts* for the Turkish Government at £51 per ton, as against £63 per ton paid by Great Britain.

Dr. Macnamara replied: I have no information enabling me to make a direct comparison between the cost of building Admiralty *Dreadnoughts* in this country and the cost referred to in the question for building two *Dreadnoughts* for the Turkish Government. I know no reason why the Admiralty should pay more per ton to a British firm for Admiralty *Dreadnoughts* than the firm would charge a foreign government for similar work. I may add that, taking the case of the latest Admiralty *Dreadnought* delivered from contractors, the total cost of hull, armor for hull, and machinery works out at substantially less than £63 per ton of the total displacement of the ship.

Dr. Macnamara gave the following particulars as to the *Dreadnoughts* already completed:

	Tonnage.	Average cost per ton of total displacement.
Dockyard built:		
Dreadnought	17,900	£99.8
Bellerophon	18,600	£94.8
Temeraire	18,600	£93.7
St. Vincent	19,250	£89.4
Collingwood	19,250	£87.1
Contract built:		
Superb	18,600	£89.2
Vanguard	19,250	£83.4

Any comparison instituted between the cost of dockyard-built ships on the one hand, and contract-built ships on the other was subject to the reservation that the bases of cost were not precisely identical. That particularly applied to the items included under the heading "Indirect Charges."

European Naval Construction.—Dr. Macnamara states that the proposed expenditure for 1911-12 for Great Britain, and Germany, Austria, and Italy respectively, on new construction and armaments is as follows: Great Britain, £17,566,877; Germany, £11,715,752; Austria-Hungary, £3,125,000; Italy, £2,277,302. The amount given for Italy is liable to alteration, as the estimates have not been finally passed.

Gunnery Practice.—Mr. Bird asked the Secretary to the Admiralty whether, bearing in mind the inexpendiency of publishing the detailed accuracy of the big-gun shooting in the navy, whereby the standard of efficiency attained by our gunners was made known to the whole world, he would order that in future these results be no longer published.

Dr. Macnamara replied: The publication of a certain amount of information as to the results obtained in gunnery practices is of great advantage in stimulating competition. The form in which the information is published does not appear to justify the adoption of the course suggested by the honorable gentleman.

Gun Deafness.—In reply to a question as to whether he would issue an order making it compulsory on both officers and men to wear some form of ear protection when gun firing was taking place on board ship, Dr. Macnamara stated: Cases of gun deafness undoubtedly occur, but there are no grounds for attributing any considerable number of invalidings for disease of the ear to the effects of gun-fire. Protective material is already provided and can be drawn by ships. The use of cotton wool, a supply of which is always to hand, as a protective material is now so general that it would appear to be unnecessary to issue the order suggested.

Cruisers of the Chatham Class.—Mr. Burgoyne asked the First Lord of the Admiralty if he would state the displacement, indicated horse-power, designed speed, and armament of the protected cruisers of the *Chatham* class; when were the three vessels of this type laid down; and when was it anticipated that they would be completed? Mr. McKenna replied: The particulars asked for in the first part of the question are substantially the same as for the *Weymouth* class. The *Chatham* was laid down on January 3, and the anticipated date for her completion is August 31, 1912. The *Dublin* and *Southampton* were laid down last week, and the contract dates for their completion are June 18, 1912, and August 19, 1912, respectively.

Internal Combustion Propulsion Machinery.—Mr. McKenna states that internal combustion propulsive machinery is being fitted in submarines and certain small craft. The suitability and development of this type of machinery for other classes of vessels is receiving careful consideration.

Destroyers of the 1911-12 *Program.*—The destroyers of the 1911-12 program will probably be ordered in July, and will, it is hoped, be completed in 18 months from that date.

Aeroplanes and the Navy.—Asked whether the navy owned any aeroplanes at the present moment, or whether they had any on order, Mr. McKenna stated that the reply was in the negative.

Mr. Lee asked if it was a settled policy that the Admiralty should have nothing to do with aeroplanes, and that that branch of aeronautics is dealt with by the War Office. Mr. McKenna replied: Settled in the sense of permanent, I cannot say; but so far as experimental work is concerned the War Office have undertaken the aeroplane branch of aeronautics, and the Admiralty are experimenting with dirigibles.

German Naval Reserves.—Asked if he could state any particulars of the German naval reserves drawn from unofficial sources, Mr. McKenna said: The conscripts who form the bulk of the naval *personnel* are, under ordinary circumstances, placed in the naval reserve for four years on completion of their term of compulsory service, and during this period are under obligation to do two trainings of not more than eight weeks each. They are then placed in the Seewehr 1st Levy for three years, or, in certain cases, five years, and are liable to two trainings of from eight to 14 days. On the expiration of this period they are placed in the Seewehr 2d Levy until 39 years of age, and in time of peace are not liable to undergo training but may serve voluntarily. They then pass into the Landstrum until the age of 45. Approximately the first reserve in time of war would contain two-thirds of the number of the active service *personnel*.

British and German New Naval Construction.—The First Lord of the Admiralty gives the figures representing expenditure on new naval construction and armaments in the United Kingdom and Germany in each year since 1890. In the year 1890-1 the British Government spent £3,272,851 and the German £1,844,712 on their respective navies. From that year up to 1893-94 the expenditure rose or fell, but since 1894 there has been an almost continuous rise in both countries. The figures for the last 10 years were:

	United Kingdom. £	Germany. £
1900-1	10,025,551	3,401,907
1901-2	10,332,780	4,653,423
1902-3	9,782,217	4,662,769
1903-4	12,398,133	4,388,748
1904-5	12,964,419	4,275,489
1905-6	11,368,744	4,720,206
1906-7	10,486,397	5,167,319
1907-8	8,849,589	5,910,959
1908-9	8,521,930	7,795,499
1909-10	11,076,551	10,177,062
1910-11	*14,741,474	11,392,856
1911-12	†17,559,685	11,715,752

* Probable expenditure. † Estimated expenditure.

Invincible Cruisers in 1915.—Mr. Yerburgh asked what would be the number of cruisers of the *Invincible* type under present programs in 1915 of the following powers: Great Britain, Germany, Austria, Italy, Japan and France?

Dr. Macnamara replied: On April 1, 1915, Great Britain will have nine, excluding the cruiser building for Australia. To this number will have to be added any cruisers of this type which may be included in the program of 1912-13. With regard to the other countries the figures are: Germany, six; Japan, one; Austria, Italy and France, none.

Sale of Old Warships.—Dr. Macnamara said there were four sets of conditions of sale of obsolete ships. Ships sold under what are known as Conditions A must be wholly broken up in the United Kingdom. Ships sold under Conditions A—as modified and brought into use for the sale of His Majesty's ship *Howe* (aged 21 years) in October, 1910—must be wholly broken up, but only certain specified work need be done in the United Kingdom. Ships sold under Conditions B must be wholly broken up, but not necessarily in the United Kingdom. Ships sold under Conditions C are sold without restriction. It was proposed to sell the *Nile* (aged 20 years) and the *Trafalgar* (aged 21 years) by auction on April 4 under Conditions B, but since that decision was arrived at it has been found impracticable to prepare those two ships for sale as early as was expected, and they have therefore been withdrawn from the advertisement of the forthcoming sale.

Naval Officers and Aeroplaning.—Dr. Macnamara informed Mr. Rothschild that none of the naval officers being instructed in aeroplanes had had any practice in map-drawing from balloons, but two of the officers employed with airships had had this experience.

New Cruisers.—Mr. McKenna, answering Mr. Burgoyne, said the *Australia* and *New Zealand* will be sister ships to the *Indefatigable* in armament and speed.

Mr. Burgoyne asked the First Lord if he would state the displacement, horse-power, speed, and armament of the cruisers *Sydney* and *Melbourne*, and when it was anticipated they will be completed.

Mr. McKenna: The figures asked for are: Displacement, 5400 tons; horse-power, 25,000; speed, 25½ knots; armament, eight 6-inch guns, 2 torpedo-tubes. The contract date for completion is August, 1912.

Fuel for the Navy.—Mr. Ashley asked the First Lord if he could state the estimated expenditure on fuel in the British and German navies for 1911-12.

Mr. McKenna: The estimated expenditure in the British Navy for 1911-12 on steam-vessel coal, patent fuel, oil fuel, and petroleum spirit, including freight on first delivery, is £1,988,000. The German naval estimates for 1911-12 make provision for the expenditure of £915,110 on coal for the fleet. The freight, if any, is not shown separately, but may be included in these figures.

The Naval Airship.—Mr. Burgoyne asked the First Lord of the Admiralty whether he would state the first estimate for Naval Airship No. 1; her total cost to date; and whether the delay in her completion was due either to fault in construction or miscalculation in design.

Mr. McKenna: The total liability noted for Naval Airship No. 1 is: Hull and machinery, £40,876 17c. 6d.; spare gear, £681 3s. 5d. Payments amounting to £36,000 have been made on account. There has been no delay in her completion.

Mr. Lee: When does the right honorable gentleman anticipate that this ship will be afloat and ready for service?

Mr. McKenna: Momentarily.

Protection of Foodstuffs in Time of War.—Sir Reginald Pole-Carew asked whether any cruisers were detailed for the protection of our foodstuffs and commerce in time of war; and whether they were fully manned and in every respect ready for sea.

Mr. McKenna said: I must ask the honorable and gallant member to be satisfied with the statement that the protection of our foodstuffs and commerce is admittedly one of the primary objects of the navy in time of war, and that the disposition and preparation of the fleet in time of peace is governed by its probable duties in war. As I have already stated, it is not in the public interest to discuss the precise nature of these duties or of the preparations made for them.

The New Pointed Bullet.—Mr. Rothschild asked whether the new pointed bullet adopted by the home authorities had an aluminium point to the core, whereas the new pointed bullet adopted by certain foreign countries had an all-lead core; and, if so, whether this resulted in the English bullet being less efficient in stopping power than that adopted by other countries.

Mr. Haldane replied: The reply to the first part of the question is in the affirmative. As regards the last part of the question, from the results obtained with the new ammunition there is no reason to suppose that it is less efficient in stopping power than that adopted by foreign countries.

Launch of New Battleship-Cruisers.—Mr. McKenna in reply to Mr. Burgoyne, said: It is proposed to launch the *New Zealand* on June 29 next, but the date for the launch of the *Australia* is not at present known. Both ships will be due for commission in September, 1912, and to leave England towards the end of that year.

Dreadnought Docks.—Mr. McKenna in reply to Mr. Burgoyne, said: The number of British dry and floating docks, completed or under construction, that are capable of receiving the *Dreadnought* is as follows: In the United Kingdom, 13 Admiralty docks and nine private docks, making a total of 22. Of these 14 are available for use in the North Sea and English Channel. Outside the United Kingdom seven Admiralty docks and five private docks, making a total of 12. The total number for the German Empire is 11, of which eight are available for use in the North Sea.

Battleships Dry-Docked.—Mr. McKenna, replying to Mr. Middlemore, said: Since commissioning, the *Invincible* had been dry-docked four times, the *Indomitable* five times, and the *Inflexible* three times. No sign of structural weakness had been shown by any of these ships. Slight buckling had been found in a few frames, but not to any serious extent. He was aware that the present method of docking had been in use for more than 100 years, but there was a curious diversity of opinion as to the best method of docking; but he did not think that was of importance in the case of these particular ships.

The Guns of Foreign War Vessels.—Mr. McKenna, replying to Mr. Ashley, said that the *Texas* and *New York*, battleships building for the United States Government, are the only vessels which are known with certainty to be intended to be armed with guns of 13.5-inch caliber or more.

Largest Armed Vessel at the Naval Review.—Mr. Ashley asked whether the largest and most powerfully armed vessel present at the Naval Review on June 24 would be under a foreign flag?

Mr. McKenna said: It is believed that the United States ship *Delaware* will be the largest ship at the Review, her normal displacement being 100 tons more than the *Neptune*, the next largest ship. The armaments are very similar except that the *Delaware* has fourteen 5-inch guns against the *Neptune's* sixteen 4-inch.

The Editorship of the Army Review.—Captain Clive asked whether Colonel à Court Repington was to be the editor of the new official publication called the *Army Review;* if so, what salary he would receive; whether he would have access to documents not available to the press generally; and whether he would continue to hold his appointment on the staff of *The Times.*

Colonel Seely replied: Colonel à Court Repington has been appointed editor of the *Army Review;* salary £500 a year. His duties will be confined to editing the *Review* under the direction and control of the Chief of the Imperial General Staff. He will, of course, not have access to any

confidential documents. He will be at liberty to engage in any other literary work for which he has time.

Lord Balcarres asked would this officer have access to documents to which other journalists would not have access.

Colonel Seely: He will only have access to such papers as will be necessary for the conduct of the journal, in the same way as the French and German editors of similar publications have access to documents not of a confidential character. I do not see how it could be possible to have an editor under different terms from those I have explained.

Lord Balcarres repeated his question, which he thought the right honorable gentleman had not understood.

Colonel Seely: It is difficult to say more on the duties of the new editor until we have experience of how things work. I do not think there will be any inconvenience or injustice to any journalists. The scope of this journal will be similar to that of the French *Journal Militaire* and the German quarterly publication of the general staff.

Mr. Hunt asked if criticisms of the war office policy would be allowed.

Colonel Seely: The fullest liberty will be allowed to expressions of opinion by contributors consistent with the maintenance of due order and discipline. The editor will have the duties of editor under the control of the Chief of the General Staff and the Secretary of State for War.

Mr. G. Lloyd asked if other journalists would be allowed to see the documents to which the editor would have access.

Colonel Seely: It is not a question of seeing documents. This distinguished officer as editor of the *Review* will receive articles from officers and others, and collate such information as he may obtain upon foreign armies and upon the higher aspects of the art of war, and I do not think the question of documents comes in.

Mr. G. Lloyd asked would he not have the opportunity of seeing war office documents.

Colonel Seely: Not confidential documents of any kind, but any papers not of a confidential character he may want, if convenient. He will act as editor of the *Review* like the French and German editors of their publications. The appointment is terminable at short notice on either side. It has not yet been made at all permanent. I hope the publication will be of great use to the officers of the army.—*Army and Navy and United Service Gazettes.*

THE PRICE OF WARSHIPS.—The information given by the Grand Vizier to the Turkish Chamber, as a reason for discriminating in the selection between two private British firms, is of considerable interest to the taxpayers of this country. Incidentally this explanation gave the cost per ton that the Turks will pay for their new warships, without the guns, and it also indicates the cost of the armament over and above the building and equipping of the hull and engines. The price, it appears, which the British Admiralty pays to Messrs. Armstrong, Whitworth & Co. for building British battleships is £89 per ton. This sum apparently includes armament, since after having asked £95 per ton from the Turks the firm eventually offered to build the hull and engines for £51 per ton, as against the £63 per ton paid to them by Great Britain. The armament is to cost the Turks about £385,000 per ship, which works out at £21 per ton. A deputy thought that such prices either meant inferior material or inferior workmanship, when measured by the contracts entered into by the British Admiralty. For this sum of £21 per ton for armaments the Turkish battleships will be armed with a 14-inch gun in their twin-gun turrets, which will give Turkey capital ships of the very latest type, and of abnormal fighting powers.—*United Service Gazette.*

In view of the discussion as to the cost of warships, the following comparison between the battleships *Neptune*, 19,900 tons (built at Portsmouth

Dockyard), and *Hercules*, 20,000 tons (Messrs. Palmer's Shipbuilding Co., Jarrow), is of interest. In the case of the *Neptune* the 1911-12 navy estimates show two sets of figures differing by over £48,000 in the details; but that set which agrees with the "completed" total has been taken. Details of the protected cruiser *Glasgow*, 4800 tons, are added for comparative purposes:

	Neptune. £	Hercules. £	Glasgow. £
Hull, fittings and equipment, total cost	787,403	855,276	166,170
Do., per ton of completed displacement	39.568	42.764	34.619
Do., percentage of total cost	47.242	51.463	46.824
Propelling and other machinery, total cost	249,773	237,968	146,644
Do., per ton of completed displacement	12.551	11.898	30.550
Do., percentage of total cost	14.985	14.319	41.319
Gun mountings and torpedo-tubes, etc., total cost	398,636	410,375	20,525
Do., per ton of completed displacement	20.032	20.519	4.276
Do., percentage of total cost	23.917	24.693	5.781
Guns, estimated cost	141,000	131,500	14,860
Do., per ton of completed displacement	7.085	6.575	3.096
Do., percentage of total cost	8.459	7.912	4.187
Proportion of establishment and incidental charges	89,932	26,792	6,685
Do., per ton of completed displacement	4.519	1.339	1.393
Do., percentage of total cost	5.396	1.612	1.884
Total cost per ton, complete	83.755	83.095	73.934

—*United Service Magazine.*

THE NAVAL ORDNANCE DEPARTMENT.—A very general feeling of satisfaction has been caused throughout the navy by the action of the Admiralty in opening to the marines the appointments in the inspection and experimental portion of the Naval Ordnance Department. It was only as far back as 1906 that the navy began to do its own inspection and experimental work in this department, the work having previously been performed for the senior service by the members of the Army Ordnance Corps, officers from which unit are still in charge of naval magazines and arsenals, and have charge of naval ordnance stores at nearly all the large naval centers. But as developments take place, these posts will be filled by expert gunnery officers of the navy, who are fully equipped with the technical knowledge required to adequately fill such posts. It is admitted by both sides that these billets should now be filled by naval officers, and by none is this more freely conceded than by members of the Army Ordnance Corps, with the sole reservation that the interests of officers at present holding posts in the corps of the sister service must be conserved. The marines will, as pointed out above, share equally with naval officers in appointments for inspection and experiment at Whitehall and the manufacturing centers where posts have already been established, and at other centers as the naval system is developed; they will be seconded while so employed, as are the members of the Army Ordnance Corps, and allowed to retire after they have put in sufficient service to entitle them to do so under the regulations. This concession will lead both to contentment and efficiency, and is therefore in the best interests of the State.—*United Service Gazette.*

In view of the entry of a new term of naval cadets it is of interest to learn officially that since the new scheme for the training of officers came into operation in September, 1903, the number of cadets entered up to the end of last year was 1580. Of these 173 withdrawn, 108 for inability to keep up with the work, and 65 owing to ill-health and other reasons. At the end of last year 450 midshipmen under the new scheme were in ships at sea.—*The Engineer.*

In view of the tendency of young officers entered under the new training system, to neglect their nautical education now that they have to perform duties in the engine-room department of ships, Admiral Sir Francis Bridgeman, commander-in-chief of the home fleet, has issued an order that whenever the fleet is at sea all sub-lieutenants and midshipmen are to keep a daily reckoning by observation of the ship's position, whether in sight of land or not. No midshipman is to be excused on any account. This is in addition to any other obligatory observation.

THE NAVAL AIRSHIP.—As our rigid dirigible may be soon expected to commence its trials, it will perhaps not be out of place to mention a few details connected with this, Britain's first attempt to add a gas-supported airship to her navy. The vessel is 512 feet in length, and 48 feet as regards its master diameter; but although the rigid hull or skeleton framework is modelled to some extent on that of the Zeppelin creations, it differs from them in being fish-shaped instead of cylindrical, and thus presenting a stream-line form to the air in its forward progress through that element. The frame work is built up of longitudinal lattice girders of "Duralumin," connected by vertical intercostal divisions at intervals. Within this skeleton are eighteen separate hydrogen balloons in compartments, and the enclosing framework is covered with silk, water-proofed by the process known as "Ioco," the upper half of the covering being sprinkled with aluminium dust to minimize radiation, and the lower half being yellow. A covered keel runs along the hull, and is developed at the stern into a long vertical fin. There are two gondolas, or boat-shaped cars, which are rigidly attached to the hull, and communication between them is made by a covered gangway running through the keel. Each gondola contains a ten-cylinder, 120 horse-power Wolsely motor; the first motor drives two two-bladed propellers, one on either side of the car, through shaft-gearing. The rear motor is coupled direct on to a single propeller revolving immediately in its rear under the hull. The rudders, air-planes, etc., are worked from the gondolas, where compasses and other appliances connected with the navigation of the huge aircraft are arranged. The propellers have been designed as a result of experiments made on the large whirling table, specially constructed at the Vickers works, for testing airship and aeroplane propellers. Four sets of elevators are carried, one set of three super-posed planes at each side of the bows, and one set of three at each side of the stern. Three multiple rudders are used for horizontal steering, two sets of four pivoted to the stern of the hull, and a set of three immediately to the rear of the aft propeller. Two large fixed horizontal planes run along the aft part of the hull.

The great aircraft represents long-continued experimental work, much anxiety, and numerous set-backs to those responsible for her construction. To begin with, the contractors had great trouble in building the protective shed to contain the dirigible, which is supported partly on the dockwharf at Barrow, and partly on piles driven into the dock. The piles sank into the sand which forms the bed of the dock, owing to the weight of the superstructure, as it was building. This difficulty was eventually met by surrounding the piles with concrete. Then the sections of the airship originally made for test purposes were found to be unsatisfactory, and had to be discarded. The large quantity of aluminium purchased for the work could not be used—it was found to be untrustworthy in sections of great length. After long continued tests Messrs. Vickers' chemist discovered a magnesium alloy of aluminium, as strong as mild steel and only one-third the weight. This was pronounced suitable, and has been named "Duralumin."—H. Bannerman-Phillips in the *United Service Magazine*.

The naval maneuvers off the coast of Spain were the means of providing officers and men with some very useful experience in the problems of searching for an enemy at sea. Two fleets of equal strength (ten battleships and seven armored cruisers each) were supposed to be in search of

each other in mid-ocean with a view of coming to an engagement, Vice-Admiral Sir George Callaghan being in command of the Red, while Admiral Sir E. S. Poë had command of the Blue. Each admiral knew the strength and speed of his opponent. The cruisers on either side were to be employed to discover the enemy, and the object of each admiral was to come upon the other with a superior force, his cruisers having rejoined, and so crush his enemy. Operations commenced by Red proceeding south while Blue made his way north. After several hours' search Red's second cruiser squadron came upon Blue's fifth cruiser squadron. Blue at once made off with all speed and informed his admiral, and all the cruisers hurried to rejoin the main body, and so await the coming battle. Each side was at full strength. A general action took place, the firing opening at long range, which was, however, soon reduced. Admiral Sir William May was the umpire-in-chief, with his flag flying in the *Dreadnought*. The first ship to be ordered out of action was the *Cornwallis*. She was protecting the rear of Red's line, and had been severely handlel by Blue's cruisers. Then two of Blue's battleship's fell. After some hours of fighting Sir William May signalled a cessation. On counting up losses, it was found that Red had suffered most, having lost four battleships, and three armored cruisers, while Blue had only lost three battleships. After the action other tactical exercises were carried out, and the fleets proceeded to Pontevedra Bay.

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Dante Alighieri	19,000	Gov't Yard, Castellamare.	Launched Aug. 20, 1910.
Cavour.	22,000	" " Spezia.	Building.
Giulio Cesare	22,000	Ansaldo-Armstrong.	"
Leonardo da Vinci ...	22,000	Genoa (Odero).	"
Scouts.			
Quarto	3,400	Venice.	Building.
Marsala	3,400	Castellamare.	"
Nino Bixio............	3,400	"	"

The *Giorgios Averof*, the armored cruiser built by the Orlando Company at Leghorn and sold to Greece, has successfully completed her steaming trials, attaining a maximum speed at nearly 24 knots.

According to *La Vie Maritime* the steaming trials of the *Dante Alighieri* have been begun and are being hastened as much as possible.

The Parliamentary Committee has now approved the new vote of 160,000,000 lire (£6,400,000) for the two 22,000-ton battleships for the Italian Navy, two 4000-ton scouts, and twelve destroyers. The two *Dreadnoughts* will be constructed by the Ansaldo firm at Genoa, and the Orlando firm at Leghorn. The vote is in reality in completion of the 1909 program, and the vessels comprised under it will be commenced about six months hence and finished in 1914.—*Page's Weekly*.

The Italian naval estimates for 1910-11 amount in the aggregate to £7,700,000, of which money £6,400,000 is devoted to the navy and the rest to the mercantile marine service. The estimates are £416,000 more than in 1910-11. The projected battleships will, it is stated, have the displacement of the *Leonardo da Vinci* class, being about 22,000, but their speed will be increased, and they will carry guns of 13.5-inch caliber.

The two Italian scouts *Marsala* and *Nino Bixio*, laid down at Castellamare, are to be launched in December this year. Their characteristics are: Length, 458 feet; beam, 45 feet; draft, 15½ feet; displacement, 3435 tons; indicated horse-power, 22,500, with Curtis turbines; designed speed, 29 knots; armament, six 4.7-inch and six pounders; also three tubes, two broadside ane one astern.—*The Engineer*.

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Under trial.
Aki	19,800	Kure.	" "
Kawachi	20,800	Yokosuka.	Launched Oct. 15, 1910.
Settsu	20,800	Kure.	" Apr. 1, 1911.
——	24,000	"	Ordered.
Armored Cruisers.			
1	27,000	Vickers.	Building.
2	27,000	Kobe.	Ordered.
3	27,000	Nagasaki.	"
4	27,000	Yokosuka.	"
Protected Cruisers.			
Shikuma	5,000	Sasebo.	Launched Apr. 2, 1911.
Yahagi	5,000	Nagasaki.	Building.
Hirado	5,000	Kobe.	"

STEAM TRIALS OF THE "AKI."—The battleship *Aki* has recently completed her trials, and as she is the first of the new Japanese battleships to be fitted with turbine engines, the trials have been watched with great interest.

The ship was laid down at the Imperial Yard at Kure in March, 1905, launched in April, 1907, and completed for sea in the early part of 1910, and has since been undergoing a prolonged series of trials to thoroughly test the turbine system. Her dimensions are as follows: Length between perpendiculars 492 feet; beam, 84 feet; maximum draft, 28 feet 9 inches. Her length over all is 499 feet and her normal displacement 19,750 tons. The protection of the *Aki* is moderate only, the main belt being 9 inches thick amidships, 6 inches at the bow and 4 inches at the stern. The main battery is protected by from 8 to 10 inches of armor. In view of the fact that our 45-caliber 12-inch gun has penetrated 10-inch armor at 8000 yards range, the protection of the vitals in this ship must be considered rather too light. The armament of the *Aki*, however, is unusually heavy for a vessel of her displacement. All the guns are 45 calibers in length. Forward and aft are two 12-inch. On the broadside, in two-gun turrets, are twelve 10-inch. All of these main guns are mounted on the upper deck, which has an average freeboard of 19 feet, the axes of the guns being, therefore, from 23 to 25 feet above the normal water-line. On the gun deck are twelve 6-inch, widely distributed, eight of these being protected by the 6-inch armor of the central battery. The torpedo armament is heavy, consisting of five torpedo discharge tubes. The *Aki* has the great defect that when she is fighting a broadside engagement, no less than six of her 10-inch guns, being on the lee side of the ship, will be masked by the funnels and the turrets on the opposite beam, and will therefore be idle.

The Curtis turbines with which the *Aki* is driven are 12 feet in diameter, and they were contracted to show an aggregate horse-power of 24,000. The vessel was originally designed for 19-knot speed, which was to be obtained with reciprocating engines; but subsequently, it was resolved to substitute a pair of Curtis turbines driving twin propellers.

In the recent progressive official trials, at 94 revolutions per minute and 1352 shaft horse-power, the *Aki* was driven at 8.4 knots for a consumption of 31.9 pounds of steam per horse-power per hour. At 160 revolutions and 5773 horse-power, the speed was 13.9 knots or a consumption of 19.5 pounds of steam per horse-power per hour. At 221 revolutions and 16,115 horse-power the speed was 18.6 knots for a consumption of 15.3 pounds of steam, and at 259 revolutions and 27,740 shaft horse-power, the speed was 20.2 knots for a consumption of 14.4 pounds of steam.

Vice-Admiral Saito, Japanese Minister of Marine, has informed the Japanese Budget Commission that a proposed expenditure of £8,800,000 (to be spread over six years from 1911 to 1916 inclusive) will only suffice for the construction of a battleship, four armored cruisers, and some torpedo-boat destroyers or submarines. The battleship proposed to be constructed will have a displacement of 24,000 to 25,000 tons. Of the four armored cruisers one has been ordered from the British firm of Messrs. Vickers, Sons & Maxim, Limited, and the three others are to be laid down at Kobe, Nagasaki and Yokosuka, respectively.—*The Engineer.*

It is expected that another battleship will be laid down at Kure on the slips from which the *Settsu* was launched on April 1. The vessels recently constructed at Kure are the battleship *Aki* and the cruisers *Ikoma* and *Ibuki*. The *Settsu* was launched in the presence of the Prince Imperial, who afterwards proceeded to Sasebo in the *Tsukuba* in order to be present at the launch of the cruiser *Chikuma*. It is announced that two battle cruisers will be built respectively at Kawaskui yard, Kobe, and the Mitsubishi yard, Nagasaki. These will displace from 27,000 to 28,000 tons, and will be sister ships of the vessel now in hand at Barrow. One of them will have Parsons turbines. It is said that the ordnance will comprise either ten or twelve 13.5-inch guns. The Japanese private yards are thus advancing from the construction of vessels of 5000 tons to the largest type. It will remain to lay down, for the completion of the program, one large cruiser and one battleship, and it is probable the former will be commenced at Yokosuka. The new battle cruisers are to be completed within three years. When the order was given to Messrs. Vickers it was assumed that the Japanese were not yet equal to the building of the largest vessels of *Dreadnought* type, and were seeking other experience. To some extent this might be true, but apparently the plans were desired to be obtained from Messrs. Vickers, and it was necessary that one vessel should be built in England. The berth upon which the battleship *Kawachi* was built being too small for the great length required by modern battle cruisers, another berth has been constructed at the Yokosuka dockyard, upon which it is understood that next October a ship of 26,800 tons, being an improved sister of that being built at Barrow, will be laid down. It is said that she will carry fourteen 12-inch guns, or even guns of larger caliber, but upon this point considerable reserve may be entertained. Three submarines are to be launched in 1911, increasing the number to 13.—*Army and Navy Gazette.*

From the papers just to hand from Japan we learn that, although the decision of the Japanese Government to place the construction of an armored cruiser, with a displacement of 27,000, with the firm of Messrs. Vickers, Sons & Maxim, has caused some discussion, it was arrived at after a deliberate consideration of the question of the designs submitted and of the present conditions of the Japanese naval arsenals and private yards, which are now fully occupied with naval construction, as was declared in the official statement. Excluding the new battleship *Aki* (19,800 tons) and the armored cruiser *Kurama* (14,620 tons), ten warships, of altogether 66,000 tons, are in the course of construction at the four naval arsenals and at the Mitsu Bishi and Kawasaki shipyards.

The actual strength of the Japanese Navy at present is shown in the following table:

	Tons.
Battleships (14)	222,234
Time-expired battleship (1)	10,960
First-class cruisers—armored and unarmored, of 8000 tons or upwards (13)	138,052
Second-class cruisers, from 4500 tons upwards (7)	38,052
Third-class cruisers, from 2000 tons upwards (13)	43,713
Destroyers (57)	....
Torpedo-boats (59)	....
Submarines (13)	....

The Japanese at once strike off the effective list the ships which become out of date and inefficient. Some time ago it was announced that the *Chinyen* was to be struck off, and it is now stated that the same fate will befall the *Iki*. It seems only yesterday that the *Chinyen* figured upon the scene as one the China's two battleships which were strong enough to hold command of the Eastern seas until their flags were lowered in the battle of the Yellow Sea and at Wei-hai-wei. As for the *Iki*, she took her part in the Russo-Japanese War as the *Emperor Nicolai First*, and had previously acted a prominent part in Far Eastern waters, for she was the flagship of the Russian admiral at Chefoo when Viscount Ito Myoji proceeded thither for the ratification of the Shimonoseki treaty. She now goes to the scrap-heap, and her place is taken as a unit of the training squadron by the *Fuji*, which was one of Japan's first two battleships—the battleships for which the Diet refused to grant money until the Emperor decreed that 10 per cent of all official salaries, beginning with the privy purse, should be assigned for naval purposes during a period of ten years. The ideas of the Japanese have grown much since that time.—*Engineering*.

The *Shikuma*, the first of the 5000-ton scouts, was launched on April 2. These vessels are to have an armament of eight 6-inch guns and three 18-inch torpedo-tubes.

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I	16,900	St. Petersburg.	Under trial.
Andrei Pervozvannui	16,900	"	Building.
Evstafi	12,500	Nicolaiev.	Under trial.
Sevastopol	23,000	St. Petersburg (Baltic Wks.).	Building.
Petropavlovsk	23,000	" "	"
Poltava	23,000	" (Admiralty Yd.).	"
Gangoot	23,000	" " "	"
Armored Cruisers.			
Bayan	7,800	St. Petersburg.	Under trial.
Pallada	7,800	"	" "
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

It is thought that the *Imperator Pavel Ier*, which has begun her steam trials after having been seven years building, will be ready for commissioning this autumn.

NAVAL PROGRAM.—The reorganization of the Russian Admiralty is now assured, writes the St. Petersburg correspondent of the *Times*: The Duma has voted 150 million roubles (£15,000,000) for immediate shipbuilding in the Black Sea and an equal sum for the Baltic. The immediate naval program includes four *Dreadnoughts* and six submarines for the Black Sea and four *Dreadnoughts* for the Baltic, in addition to the four which will be launched in July. The Minister of Marine will shortly present the full shipbuilding program, which will be spread over 20 years. A small island at the mouth of the Neva will be transferred to the Admiralty for a new dockyard, and the preparation of another dockyard is also contemplated. The Minister of Marine announces that Reval will become a naval base instead of Libau.—*Page's Weekly*.

RUSSIA AND TURKEY.—The new development of the Turkish fleet in relation to the increase of naval activity in the Black Sea. It is perhaps curious that British enterprise should have some part in both these developments. Admiral Skrydloff has reported in favor of the immed-

building of six battleships in the Black Sea, the ordnance and armor being obtained from foreign makers, and the Minister of Marine, Admiral Voievodski, is credited with the intention of building four such vessels, as well as a large number of destroyers and submarines. There appears to be little doubt that a period of activity is about to begin in that quarter. The first necessity is to set the shipbuilding resources in the Black Sea upon a completely modern footing. New machinery and new facilities of many kinds are required. As was the case with Spain, Russia is believed to be calling in British aid in this important part of the business. The *Novoe Vremya* has stated that a 15 years' contract is to be entered into with a British firm from the supplying of the Nikolaieff yard with new plant, and the *Bourse Gazette* has asserted that Messrs. Vickers are about to take over the Franco-Belgian yard there. The Duma has had laid before it a statement as to the dangers that might arise from the growing strength of Turkey. Meanwhile, Turkey, alarmed at dangers from the increasing strength of Russia—not leaving Austria out of the account—has bought two battleships and four destroyers from Germany, and has now entered into a contract for the building of two powerful battle cruisers in British yards by the Vickers-Armstrong group. Evidently the naval situation in the Near East and the Mediterranean is of growing interest and importance.—*Army and Navy Gazette.*

SPAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
España	15,400	Ferrol.	Building.
Alfonzo XIII	15,400	"	"
Jaime I	15,400	"	Ordered.

TURKEY.

It is stated that the provisional contract with Sir W. G. Armstrong, Whitworth & Co. for two *Dreadnoughts* for the Turkish Navy provides for the delivery of the hulls and engines within twenty-two months. The contract speed is to be twenty-one knots, and turbine engines will be employed. It is stated that the price will be at the rate of £51 per ton exclusive of armament.—*Page's Weekly.*

UNITED STATES.

VESSELS BUILDING.

No.	Name. *Battleships.*	Speed. Knots.	Where Building.	% of Completion Apr. 1.	May 1.	June. 1.
30	Florida	$20\frac{3}{4}$	Navy Yard, New York.	91.4	92.7	93.4
31	Utah	$20\frac{3}{4}$	New York Shipbl'g Co.	97.5	98.0	98.3
32	Wyoming	$20\frac{1}{2}$	Wm. Cramp & Sons.	56.8	61.5	65.6
33	Arkansas	$20\frac{1}{2}$	N. Y. Shipbuilding Co.	63.3	64.7	66.2
34	New York	21	Navy Yard, New York.	0	0	0.4
35	Texas	21	N'pt News S. B. Co.	4.6	9.3	13.5

LAKE SUBMARINES.—Three submarines of the Lake type will soon be added to our navy. The first of these, the *Seal*, was launched from the yard of the Newport News Shipbuilding and Drydock Company on February 8. Another Lake boat, the *Tuna*, is under way at the same yard, and the third, the *Turbot*, is being constructed at the yard of the Lake Company, at Bridgeport, Conn. The contract calls for her delivery in twenty months.

The *Seal*, when completed, will be the largest and most powerful sub-

marine in the U. S. service, with general dimensions and chief characteristics as follows: Length over all, 161 feet; extreme beam, 13 feet; submerged displacement, about 525 tons; armament, six torpedo-tubes, with stowage for ten torpedoes; the contract calls for 14 knots surface speed, but 16 knots are expected; submerged speed called for is 9½ knots; the cruising radius at economical speed on surface will be over 2500 knots. She is designed for long ocean cruises in rough weather and without being accompanied by a tender.

The following distinctive features are characteristic of the Lake type of submarines, and are embodied in the *Seal:* Bottom wheels, diving compartment, hydroplanes, drop keels, anchor weights. The bottom wheels are used in shallow waters. In moving on the bottom a cyclometer gives a fairly accurate record of the distance traveled and the gauges give an absolute record of changing depths. The diving compartment provides an exit for a diver sent for investigation or for making repairs to the vessel, and it furnishes a safety chamber for the escape of the crew in case of accident. By the use of the hydroplanes the boat can be kept at a uniform depth. The drop keel permits the release of several tons of weight and a corresponding increase in buoyancy. It also increases the longitudinal stability of the boat. The anchoring weights are designed to secure immobility at any desired depth, and the vessel can be drawn to the bottom by winding in their cables. The weights can be operated without the exposure of any of the crew on deck, and, if necessary, can be cast loose instantly to increase the buoyancy of the vessel. A special form of storage cells and connections is used in the batteries of the Lake boats.—*Army and Navy Journal.*

RENAISSANCE OF THE NAVAL RECIPROCATING ENGINE.—When it was recently announced that the Navy Department had decided to return to the reciprocating engine as a drive for battleships, we expressed astonishment that this should be done at a time when every other naval power was using the steam turbine exclusively. That the action of the Department was based upon fact and sound reasoning, however, is shown by the comparative steaming results obtained from two sister ships, the *North Dakota,* which is equipped with turbine engines, and the *Delaware,* driven by standard reciprocating engines.

An opportunity for comparison of coal consumption under identical conditions was recently afforded when the two ships were steaming with the North Atlantic fleet, the *North Dakota* in position directly astern of the *Delaware.* We are officially informed that average results for ten days show that using coal from the same collier, employing the same auxiliary engines, and steaming at the same speed, of 12 knots, under identical conditions of wind and weather, the *North Dakota* consumed 43 per cent more coal than the *Delaware.*

It has always been understood that the turbine showed its best efficiency when it was being driven at full speed, under which conditions its coal consumption is as good if not better than that of the reciprocating engine. At anything less than full speed the turbine consumption becomes relatively larger and at cruising speed considerably so. But it has taken such a test as this, made under sea-going conditions, to show just how extravagant is the coal consumption of the turbine under cruising conditions. At the same time it must be remembered that the turbines of the *North Dakota* represent a comparatively early type, and that in the later designs the coal consumption at moderate speeds has been reduced.

What makes the record of the *Delaware* so very significant is the fact that she recently carried out her annual full-speed trials, at the close of some 19.000 miles of all but continuous steaming, and under conditions which show her reciprocating engines to be remarkably reliable, and capable without any preliminary preparation, of equaling and even surpassing the results obtained during the original acceptance trials. We in-

vite attention to the following facts which are taken from the log of the ship:

Early in the present year the *Delaware* steamed at 12 knots from Cherbourg for Guantanamo, Cuba, where she received wireless orders to proceed at once at 15 knots to Hampton Roads, a further distance of 1100 miles. She reached Hampton Roads with 500 tons of coal in her bunkers. Here, after thirteen days in port, she received instructions to take the body of the Chilian Minister to Valparaiso, which she did; and after ten days at Valparaiso steamed back around the Horn to Boston. At 5 a. m. of April 26, when nearing Boston harbor, a wireless order was received from the Navy Department, to hold the annual "surprise" steam trials of the vessel at once. She reached Boston at 10.30 April 26, took on a thousand tons of coal and fresh provisions, and left at 9 a. m., April 27, for the trial course.

This was a surprise trial with a vengeance; for the ship had just concluded some 19,000 miles of steaming without undergoing any dock repair or machinery over-hauling whatsoever. Nevertheless, the *Delaware*, steaming for four consecutive hours, at full power, made an average of 21.86 knots, which is nearly a third of a knot more than the 21.56 knots she made on her official trials. But she did even better than that; for on the twenty-four hours continuous run at full power, she averaged 21.32 knots, and this in spite of the fact that she was burning coal only, had her regular watch in the fire rooms and was cleaning fires as usual. A further tribute to her engine-room efficiency is found in the fact that the ship has steamed 30,000 miles without any adjustment of her engines.

If there is any better record of motive power efficiency on a modern *Dreadnought* than this, it would give us great pleasure to record it.—*Scientific American*.

SCIENTIFIC MANAGEMENT IN THE NAVY.—A report which will be watched with keenly expectant interest is that of the commission lately appointed by Secretary Meyer to examine into efficiency conditions in the principal eastern navy yards. Emerson, Gantt and Day, the special commissioners, are recognized as the foremost active practitioners in the betterment of industrial efficiency. United in their acceptance of the same fundamental scientific data, they are sufficiently diverse in their philosophy or policy of applying these principles practically, and in the portions of the field in which they have respectively worked, to make their combined view comprehensive and conclusive.

The value of such a professional verdict, many-sided but non-partisan, wholly free from inter-departmental jealousies and political contrivings, unprejudiced and unimpeachable, will be inestimable. It should settle finally, for Congress and the people, the long turbulent quarrel over naval legislation and administrative policies and their total result on the fighting power of the navy.

For this, after all, is the great central purpose to which everything in the naval establishment must be tributary. The ultimate test of navy-yard organization and operation is not whether it secures the completion of repair jobs at minimum cost, but whether it contributes the maximum effect to the striking force of the fleet in action. If the training of the sea-going officers in the yards increases operating costs, that may yet be a trivial price to pay for the results of such training applied in action at sea.

And it is permissible and reasonable to infer, from Harrington Emerson's striking illustration of efficiency principles in action, that the battle practice off the Capes demonstrated to these special commissioners that "scientific management" in its most magnificent development is thoroughly understood and practically applied on our battleships. The solution of the problem of the yards may yet prove to be some means of introducing further in the shore establishment the principles and practice already highly developed on shipboard.—*The Engineering Magazine*.

ORDNANCE AND GUNNERY. TORPEDOES.

Le Yacht gives the following data concerning the latest type Italian I inch gun. Length, 46 calibers; weight of projectile, 895 pounds; muzz velocity, 2825 f. s.; elevation for 10,000 meters' range, 6° 30'; angle fall for same range, 8° 40'; remaining velocity, 1490 f. s.; penetration Krupp armor at 10,000 meters, 11.1 inches.

The British 12-inch 50-caliber gun, mark XII, is said, upon go authority, to have a service muzzle velocity of 2850 f. s. with an 850-pour projectile. The 45-caliber gun, mark XI, has a service velocity of 2700 f.

BRITISH NAVAL BATTLE PRACTICE IN 1910.—The result of the batt practice of the fleet in 1910 has been issued by the Admiralty who, in prefatory note, state that the conditions of the practice differed conside ably from those of former years, so that no comparison can be made.

The following abstract of the results gives the fleets and squadrons order of merit:

Fleet.	Ships.	Guns.	Average Points.	First ship in fleet.	Scor
Australia	5	55	212.6	Pyramus	383.
3d Division Home Fleet	10	182	192.5	Carnarvon	306.7
China	6	76	185.1	Minotaur	420.
2d Division Home Fleet and 2d Cruiser Squadron	14	202	184.0	Africa	313.
1st Division Home Fleet and 1st Cruiser Squadron	11	122	179.6	Agamemnon	316.
Atlantic Fleet and 5th Cruiser Squadron	9	135	159.6	Formidable	577.
Mediterranean Fleet and 6th Cruiser Squadron	13	179	98.3	Bacchante	191.1
†Ships inside range	0	..	....	......	....
†Ships outside range	6	90	93.6	St. Vincent	195.
Totals and averages	74	991	161.5		
Fired at fixed target.					
Cape of Good Hope	3	29	373.9	Hermes	580.

† 800 yards or over.

On the Australian Station there were three ships which exceeded tl average number of points. In the third division of the home fleet, shi which fired with nucleus crews under the same conditions as fully mann vessels, five ships exceeded the average number of points. In the Chi squadron two vessels exceeded the average. Five vessels exceeded tl average in the second division of the home fleet and second cruis squadron.

In the first division of the home fleet and first cruiser squadron si ships exceeded the average. The *St. Vincent*, which fired outside tl range, was also 25 points above the average number obtained by tl division. Three ships were above the average in the Atlantic fleet an fifth cruiser squadron. In the Mediterranean fleet and sixth cruis squadron seven vessels exceeded the average. Two ships were above tl average on the Cape Station.

Seventy-four battleships and cruisers took part in the battle practice an three gunboats, but no points were awarded for the last-named.—*Unit Service Gazette.*

BRITISH ATLANTIC FLEET GUNLAYER'S TESTS.—The week ending Mar 18 was a busy one for both the battleships and the cruisers of the fle The results of the competition, as far as it is completed to date, ha

been in the highest degree encouraging, as will be seen from the following table:

Ship.	Average rounds per gun per minute.	Average hits per gun per minute.
Prince of Wales.		
12-inch	3.33	1.61
6-inch	8.78	5.01
London.		
12-inch	4.21	.89
6-inch	8.57	4.78
Black Prince	13.67	8.44
Duke of Edinburgh.		
9.2-inch	5.56	3.06
6-inch	7.24	4.34
Doris	7.48	2.92

During the week the *London* and *Venerable* coaled. The latter nearly established a record, her average being 302.7 tons per hour, coaling from lighters one side and baskets from the mole on the other side. The *London* averaged 171 tons per hour.

On March 27 the preliminary practices for "night defence" will begin.

Much amusement was caused in the fleet by the news telegraphed from Gibraltar, and published in the English daily papers of the 14th, to the effect that the *Neptune* in her battle practice had surpassed all previous records. Such a statement is exaggeration. The *Neptune's* results were eminently encouraging, and fully justified the introduction of the new system of fire-control, but it is premature to say that she has surpassed all previous records, although she gives promise of so doing.—*Naval and Military Record.*

ADVANCE IN NAVAL GUNNERY.—Some time ago, when the *Neptune* was carrying out gunnery experiments with fittings designed by and placed on board under the supervision of Vice-Admiral Sir Percy Scott, and certain defects were discovered in the final test, after some brilliant shooting had been completed, we confidently predicted that these defects would be removed by the inventor of the new system, and that other experiments would then be carried out. We understand that the *Neptune* is now engaged in further experiments with the Scott system after certain modifications had been introduced by Sir Percy, and that after the completion of these tests the apparatus, if found to be as satisfactory as is confidently predicted, will then be fitted on board all future capital ships, beginning with the *Orion*. It is only the gunnery experts of the navy who realize the full value of the improvement, in respect to the rapidity and accuracy of heavy gun fire, that the Scott system is responsible for. We are used to moving ahead so fast in these times that minor gunnery improvements receive but scant notice and cause little comment; but when 12-inch gun fire is improved by about 100 per cent there is still room for appreciation and wonder. This is what Sir Percey Scott secured by his apparatus in the early trials of the *Neptune's* 12-inch turret fire, and the later breakdown was no fault of the new system, but clearly traceable to other causes.—*United Service Gazette.*

Submarine A1 was fired at while submerged and sunk at the eastern entrance to Spithead on May 5 with a view to testing the effect of lyddite shell on such craft. The vessel, which was 8 feet or 10 feet under water and was fired at from a torpedo-gunboat, was subsequently raised. Sweeping operations having succeeded in locating the vessel, she was slung and taken to Bembridge Ledge, Isle of Wight, where she was beached in shallow water for preliminary examination before being docked at Portsmouth.—*Army and Navy Gazette.*

GERMAN TARGET PRACTICE.—Those who hold that atmospheric conditions are responsible for the excellent shooting made by warships in Far Eastern waters will be interested to learn that the cruiser *Scharnhorst*, the German flagship in those waters, acquitted herself admirably in the December firing tests. Firing commenced at 6000 yards with a fixed target, dimensions unknown, the cruiser running at 15 knots, which increased to 16½ when the range closed down to 4000 yards. Twenty-two rounds were fired from six 8.2-inch guns, the result being 18 direct hits and one ricochet. Six 6-inch guns fired 30 rounds and registered 26 direct hits. A considerable swell was running at the time, and towards the conclusion of the firing a slight mist prevailed, to counteract which the range was decreased as above. The results, it is intimated, have never been surpassed in the high seas fleet, where the shooting standard is very high, and it is interesting to compare them with the recently published summary of the 1910 gunlayers' tests in the British Navy. At the same time, such comparisons will hardly be legitimate until we are in full possession of full information as to the conditions governing German practice, which have of late been amended more than once. Two years ago, it is known, firing was invariably postponed if the weather conditions were not absolutely ideal, and the venue was generally a sheltered cove on the Baltic coast.—*Naval and Military Record.*

GUN-WORKING MACHINERY.—In the later type of British *Dreadnoughts* the Admiralty are once more reverting to electricity as the power to operate the gun-working machines in the turrets, The unfortunate experience of the *Invincible* has not been allowed to interfere with the development of this method of working the 12-inch armament, although there was a great outcry by those whose motives could hardly be considered entirely distinterested when there was a partial failure of the *Invincible's* electrical gun-working installation. Electrical plant undoubtedly gives the best speed to the machines, and these machines can be operated in a smaller space than is occupied by machines worked with hydraulic power. Both weight and space are saved by using electrical apparatus, and as speed is gained there only remains the question of reliability, among the main essentials, for consideration. As experience is being gained it is found that electric plant can be so fitted as to remain reliable in all weather, and under all conditions of peace and war, where hydraulic power can be depended upon. It is instructive to find the *Invincible*, with the much condemned electrical system, coming out on top of the list of *Dreadnoughts* in the most searching gunnery test of last year, viz., the battle practice competition. The policy of sticking to electricity would therefore appear to be justified, and we should hear no more carying criticism from interested people.—*United Service Gazette.*

Four old warships have been set aside by the German Admiralty for use this year as target ships. One of these—the river gunboat *Vorwaerts*—which was purchased from this country in 1901, is to be used as a target by the Kiel Submarine Flotilla, the attacking boats being submerged during the firing and the torpedoes being fitted with "war heads." Another of the vessels—the old armored coast-defence gunboat *Hummel*, of 1109 tons, built at Bremen in 1881—is to be fired at by two battleships of the *Nassau* (*Dreadnought*) class and two of the *Deutschlands*, to ascertain the protective qualities of the main armor of the first batch of German *Dreadnoughts.* The armor of the *Hummel* consists of an iron belt, 4 inches to 8 inches thick, but this will be replaced over a portion of the side by a Krupp steel belt of 25 centimeters, which is the thickness of the waterline belt of the *Nassau*, *Westfalen*, *Rheinland* and *Posen.* The battleship *Bayern*, in replacement of which the first German *Dreadnought* was built, will be used as a gunnery target for the benefit of the heavy gun crews. She is a ship of 7280 tons, built in 1878, and armed originally with six

10.2-inch guns. The torpedo cruiser *Jagd*, which has been replaced by the 25.5-knot *Mainz*, will be used as a target for the smaller guns.—*United Service Gazette.*

NEW BRITISH SMALL-ARM AMMUNITION.—In introducing the army estimates of a year ago the Secretary for War announced that ammunition had been designed which would not only be capable of being used with safety with the weak-bolt action that is a feature of the Lee-Enfield, but would also possess a trajectory approximating to that required for modern warfare. At that time we ventured to suggest from the figures given that Mr. Haldane's characteristic optimism had been accentuated by professional advice that had made some mistake, and the reports that reached us during the summer months only served to corroborate our views. Failure had in time to be admitted. A successful compromise appears, however, to have at last been obtained, for in the Mark VII ammunition, which is practically approved, the bullet will be 170 grains as compared with the 215 grains of the present mark, while the charge of cordite will be increased to about 38 grains. This combination gives a pressure of under 18½ tons, one well within the capabilities of the action. The muzzle velocity is about 2400 feet per second, and the greatest height of the trajectory at 800 yards is 8 feet 4 inches, or an improvement of just 5 feet on the present ammunition. The bullet is of course a pointed one, and the principle of a compound core has been adopted. This will consist of lead and aluminium, the object of the light metal being to allow of an effective length of parallel for ballistic purposes, while at the same time to reduce the total weight.

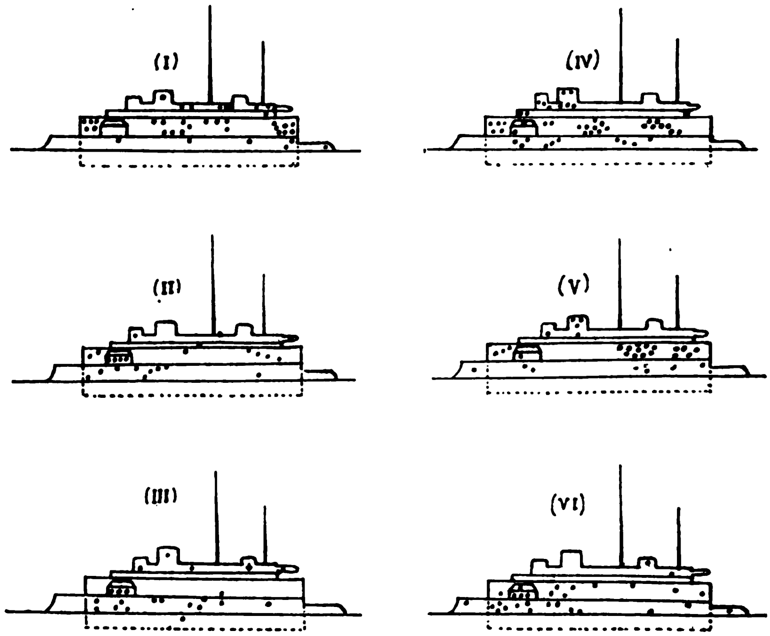
FRENCH TARGET PRACTICE.—Reference has already been made in these columns to the discussion which has taken place in France concerning the competitive firing of the ships last year. The old coast-defence battleship *Fulminant* was anchored in the southern passage of the Iles d'Hyères, and was the target. The ship had been specially prepared with light plating to show a rectangle 180 feet 6 inches long and 26 feet 3 inches high. This rectangle extended the whole length of the upper works, but not to the higher portions of the superstructure, and it descended to the bottom of the armor plate below water. The firing vessels did not know the route to be taken, because it followed a vessel which guided it and received no instructions until the last moment. The course comprised a direct run and then a spiral run, the target being about 80° forward of the beam. The battleships of the second squadron fired from a distance of 6124 yards to 7661 yards, the cruisers at rather shorter range, the battleships of the *Patrie* class at 5900 yards to 7545 yards, and those of the *Justice* class at 7115 yards to 7370 yards. These differences provided for the secondary ordnance. The speeds varied from 12 knots for the second squadron to 14 knots for the *Patrie* and *République*, as well as the cruisers of the first squadron, and 14.35 knots for the four battleships of the *Justice* class. The committee, which was presided over by Rear-Admiral Gaschard, had some difficulty in arriving at its computation of the results, but its conclusions were equitable and were made on the spot. The best firing was that of the *Justice*, which gave a coefficient of 36. The *Jauréguiberry* came next with 33.69. There were great disparities in the results, and at the bottom came the *Gaulois* with 7.5. Only those hits counted which came within the rectangle, those outside only being considered when two vessels were otherwise equal. The committee was fully competent, and general dissatisfaction was caused when it became known that its conclusions had been overruled in Paris and a new classification arrived at.—*Army and Navy Gazette.*

The accompanying sketches, taken from *Le Yacht*, purport to give the results of the firing referred to in the preceding extract in the case of the

first four ships as well as two others (*Bouvet* and *Patrie*). The hits noted are those made by guns of 4-inch caliber and above.

The following table, from the same source, gives a résumé of all the firing, taking account only of the actual hits on the 55 m. by 8 m. screen in the 6 minutes allowed each ship for firing:

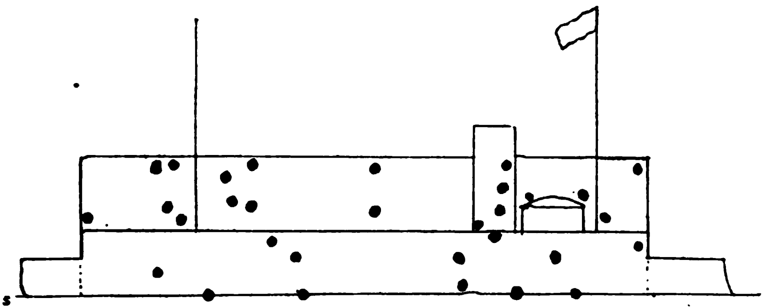
	Shots fired.	Possible shots.	Hits.	Accuracy per cent.	Efficiency per cent.
1st Squadron.					
Armored ships.....	578	659	99	17.1	15.2
Cruisers	569	640	73	12.8	11.4
2d Squadron.					
Armored ships.....	893	909	139	15.5	15.5
Cruisers	490	620	120	24.6	19.5
Total...............	2530	2828	432	17.7	15.2



I. *Jauréguiberry* (30 hits + 11 outside the rectangle).
II. *Justice* (20 hits + 4 outside the rectangle).
III. *Démocratie* (17 hits + 5 outside the rectangle).
IV. *Dupetit-Thouars* (37 hits + 10 outside the rectangle).
V. *Bouvet* (28 hits + 6 outside the rectangle).
VI. *Patrie* (26 hits + 4 outside the rectangle).

La Vie Maritime gives the following sketch and details of recent firing by the *Justice* at the *Fulminant*, which latter vessel has been refitted as a target (the rectangular screen on which hits were counted is 54 m. long

by 8 m. high). On the approach the firing was from the starboard battery at ranges from 8500 to 7000 meters, and on the retreat from the port battery at ranges from 7500 to 8200 meters. There were 22 hits out of 34 shots on the approach, with a rate of fire 92 per cent of the assigned maximum possible. For both runs the hits were 31 out of 64 shots fired.



The *Fulminant.* The *Justice* firing. 31 hits out of 64 shots at a mean range of 8000 meters.

THE AUTOMATIC PISTOL.—The automatic pistol is now a subject of great interest to the armies of the world, and it will be of interest to all to learn that the United States Government has adopted an automatic pistol for its troops. We are informed that the decision was made at the end of March, and that 50,000 pistols were ordered towards the end of April. The weapon chosen is the Colt. The pistol chosen has a seven shot magazine and a barrel 5 inches long. It weighs 34 ounces. Manufacturers have for some time been urged on to further improvements, and were given every facility by the Department to remedy the defect which had been disclosed. In this way the American Government may be said to have ingeniously assisted the development of her own automatic pistol, and they now confidently assert that they have not only in the Colt but in another—"the greatest pistols in the world." This is based on the following extracts from the Board's report after making their final selection: "Both pistols are thought by the Board to be of suitable balance, weight, caliber, energy, accuracy, simplicity, and safety for use in the military service." The Board recommended the adoption of the Colt, the Secretary of War accepted the recommendation, and on March 29, 1911, the automatic pistol became the official hand arm of the United States Army.

THE FUTURE FRENCH FIELD GUN.—In 1897 the French took the armies of Europe by surprise by the introduction and rapid issue of an entirely new gun—the present 75 mm. quick-firer. And the new gun was not an experimental equipment, requiring extensive modification to render it fit for service; it was a success from the first, and is even now one of the best guns in Europe. No other nation can show a similar record. When we decided, in 1905, to introduce a quick-firing field howitzer, it took five years to perfect the design, and the issue of the new weapon is hardly yet completed. The success of the French designers is explained by an item in the Army estimates—namely, the annual charge of £20,000 "for the study of the perfection of field guns and rifles." The French do not wait until a new gun is ordered before thinking about its design; they follow the progress of artillery science, and each new invention is considered and tested, and, if approved, is embodied in the latest experimental equipment. The Germans now do the same, and the experimental establishment at Jüterbog is jealously guarded, not even artillery officers, except the experi-

mental staff, being admitted. At present the French gun is decidedly superior to the German converted 15-pounder, and the French are in no hurry to re-arm. But as soon as the Germans begin to issue a new gun, the French will have a new and probably a better equipment, ready tested and fit for immediate manufacture. Our own authorities are inclined to be economical in the wrong direction, and grudge every penny spent on experiment. If they could be induced to imitate the French system and perfect their designs in advance, it would be a saving to the taxpayer in the end.—*Army and Navy Gazette.*

THE NEW ARMOR.—Some thirty years ago, when the increasing power of rifled guns had shown the need for armor plate of greater resistance, the makers were confronted with the necessity of providing a plate which was at once both hard and tough. Then it was that the plan was tried of welding a face of hard steel upon a backing of softer metal possessing great toughness. Excellent in theory, the system was found to be very defective in practice, chiefly because of the impossibility of providing a satisfactory weld between the two plates. At the proving grounds, the hard face would split up and break away from the backing. It was realized that in the state of the art, no satisfactory "compound armor," as it was called, could be made. Then came Harvey's brilliant invention, in which the plate was made homogeneous throughout its thickness, and the necessary hardness imparted by carburization of its front face. Krupp improved upon the Harvey process by using gas in place of solid carbonaceous material.

The process of face hardening has already labored under the disadvantage that the super-carburization of the surface could be made to reach only a certain limited depth; whereas the continued improvement both in the energy of the projectile and its ability to hold together while penetrating the hard face, has enabled the gun to once more master the plate. To-day there is a demand for a plate having a much deeper layer of face hardening than is possible by present processes. During the past few weeks, much has been written in the European technical press about a new system of face hardening, known after the name of Simpson, the inventor, who appears to have adopted the Cammel process, but with the important difference that he has introduced a plate whose weld is so perfect that under test, it present no natural line of cleavage along the line of the weld. It is claimed that this result has been obtained by interposing a thin sheet of copper between the two plates before welding them together.

As in the case of many another important invention, the author appears to have stumbled upon its secret by chance. In the course of some experiments, Simpson found that copper and steel, when subjected to a certain treatment, formed a molecular mixture or solid solution of the two metals. Later, he discovered that if two plates of steel with a sheet of copper between them were placed in a mixture of carbon, brown sugar, and water of the consistency of compressed snow, and the whole mass were heated to 2500 degrees Fahrenheit, the copper melted away into the steel and formed a weld so perfect that not only was it impossible to split the plate at the juncture, but the copper increased the tenacity of the steel. Professor J. O. Arnold, of the University of Sheffield, after making a micrographic analysis of some specimens, stated that the copper seam formed a solution which was micrographically almost indistinguishable from the steel itself. The copper seam is so completely soluble in the steel that it takes a molecular form which is beyond the range of microscopic vision. The weld, in the ordinary acceptance of the term, has disappeared, there being absolute molecular continuity.

Now, the importance of this process, in its bearing upon armor plate manufacture, is evident, since now the thickness of the hard face may be increased to any degree desired. It is stated that already trials have been made with 6-inch plates, in which two inches of hard steel were welded

upon four inches of soft backing, and that the plate, under attack by a 6-inch gun, gave very satisfactory results. If, as is claimed, the resistance of a given weight of armor has been raised from 20 to 25 per cent, it follows there is that additional percentage of a given weight of the present armor available to the designer, for improving the offensive or defensive qualities of a warship. He may increase the defensive qualities of his ship by retaining the present thickness of plate, or he may reduce the thickness of his armor and put the weight thus saved into a heavier battery or into more powerful engines, or into a larger coal supply. Probably, in view of the more powerful guns which are being mounted in the world's navies, he will choose the first-named alternative—for it is certain that, at the present time, the gun seems to have the ship at its mercy.—*Scientific American.*

MARINE ENGINEERING.

The Marine Engineer states that the *Indefatigable* has only two torpedo-tubes, not four or five as has been said, and that they are for the new 21-inch torpedo.

In recent exercises the *Dreadnought* put her torpedo-defence nets out in 1 minute 10 seconds, and the *Temeraire*, hers in 3 minutes 30 seconds. It took 3 to 4 minutes to take them in.

EXTRACTS FROM THE FIRST LORD'S STATEMENT RELATING TO MACHINERY AND BOILERS.—All war vessels completed during the present year and at present under construction have been designed with water-tube boilers and turbine engines, the latter being either of the Parsons or of the Brown-Curtis type. This latter design was first installed in the second-class cruiser *Bristol* in association with the superheaters at the boilers, and satisfactory results were obtained on the contractors' trials.

So far as can be arranged, interchangeability of the auxiliary machinery and separate parts of the main machinery is being provided for in vessels of the same type, thus following previous practice.

Additional machines have been added to the equipment of *Assistance* and *Cyclops*, enabling them still further to deal with repairs which otherwise would have required dockyard assistance.

Magazine cooling plant has been fitted in all vessels completed or at present under construction.

The boilers of all armored vessels building are being fitted to burn oil in conjunction with coal, the full power being obtainable in these vessels by the use of coal only. Satisfactory full-power trials have been carried out in the second-class cruisers of the *Bristol* class and *Blanche*, the boilers of which vessels are designed to burn oil in conjunction with coal when obtaining full power.

The torpedo-boat destroyers of this year's program are designed to burn oil only, and improvements have been made in the oil-burning fittings.

Experiments have been made and are still in progress at Haslar to reduce the excessive amount of smoke produced when burning bituminous coal in the furnaces of water-tube boilers; a substantial reduction has already been effected.

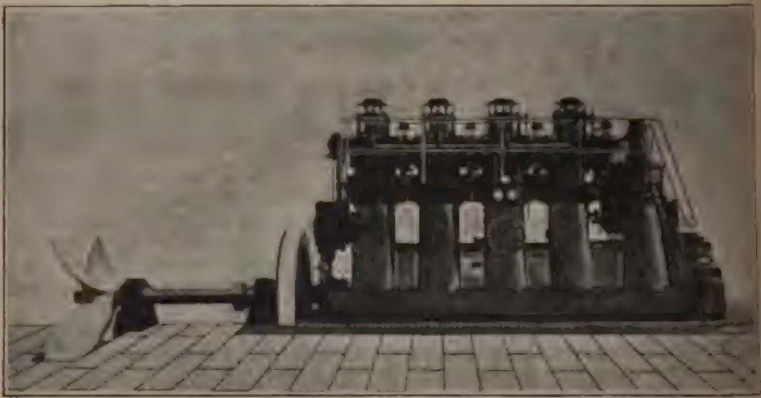
Internal Combustion Engines.—Valuable experience with the oil-driven dynamo engines fitted in H. M. ships has been obtained, and the results are being closely watched.

The initial difficulties experienced with the engines of motor boats using heavy oil are being gradually overcome.

Small petrol or paraffin-driven motor boats have been supplied to two vessels of the destroyer class and have proved very useful. All new torpedo-boat destroyers will be provided with similar boats.—*Page's Weekly.*

Messrs. J. T. Altringham & Co., South Shields, have launched the first gas-driven cargo vessel. This ship, which is named *Holzapfel I*, has been constructed to the order of the Holzapfel Marine Power Syndicate, London. She is 120 feet in length, 22 feet in breadth, 11 feet 6 inches in moulded depth, and will carry a little over 300 tons on a draft of 10 feet. She will be propelled by a set of high-speed six-cylinder vertical gas engines, having double ignition and giving 180 brake horse-power at 450 revolutions per minute.

The gas plant will be in duplicate, each division being of 100 horse-power. The power of the engine will be transmitted to the propeller shaft by a "Fottinger" transformer, which will reduce the revolutions of the propeller to any desired number—within certain limits—while the gas engine itself is working at full speed. The shaft will also be capable of stopping or reversing while the engine is running full speed ahead. The designed speed of the vessel is 7½ knots.—*Page's Weekly.*



Four-Cylinder, 1000 Horse-power Oil Engine.

A 1000 HORSE-POWER MARINE OIL ENGINE.—There is far more activity on the continent than is generally realized in connection with the construction of marine oil engines of the Diesel type for large ships, and already engines of 1500 horse-power have passed the test-bed stage. Prominent among the firms making strenuous efforts in this direction are Carel Frères, of Ghent; Schneider et Cie., of Paris, and the Maschinenfabrik Augsburg, Nurnberg, the latter company having, by the way, a three-cylinder engine of 6000 horse-power nearly completed; while Fried Krupp is said to have a marine oil engine building of well over 2000 horse-power per cylinder. In view of these facts the illustration and following brief description of a four-cylinder engine of 1000 horse-power, recently built by Messrs. Schneider & Company, in conjunction with Carel's, for a French cargo vessel that will trade on the Seine, should be of great interest. The illustration is from the Belgian paper *Neptune.*

The engine stands about 12 feet high, and is of the two-stroke reversible type, starting and reversing, etc., being, of course, by compressed air. The compressor, of the three-stage variety, is situated at the forward end, in appearance greatly resembling a fifth cylinder, and is driven off the crankshaft. This cylinder is shown next the fly-wheel. As in the case of other Diesel type engines, ignition is entirely by compression; that is to say, the fuel is sprayed in by air at a pressure of nearly 1000 pounds per square inch, causing instant combustion. As the piston on the down stroke uncovers the exhaust port in the usual manner, it also un-

covers a separate inlet port, which admits air from a special compressor at about 6 pounds per square inch. This air is also controlled by a valve in the cylinder head, which opens at the end of each stroke, allowing the cylinder to be well cleansed of all residual exhaust gases. When the piston covers the exhaust port at the commencement of the up stroke, this valve is closed. Pure air is then admitted and compressed to about 600 pounds per square inch, and the fuel is injected by the greater pressure at the top of the stroke. The same cycle of operations, of course, is then repeated continuously. It is of interest to note that it has been found necessary to water-cool the compressors as well as the cylinders and exhaust arrangements. To each cylinder there is a separate fuel pump, which can be dismounted and cleaned without stopping the engine, only the cylinder affected being put out of action. By having a separate fuel arrangement to each cylinder the fuel supply can be regulated independently if necessary. At any time the horse-power being given by any cylinder can be ascertained by the indicator diagrams with which each cylinder is equipped. Regarding lubrication, the crank case is of the enclosed type, and so forms a reservoir for the oil. It is supplied to the bearings by force from a pump, and en route it is filtered. The filter is equipped with a by-pass system, in order that it can be opened up and cleaned while the engine is running. While on test the engine gave every satisfaction.—*International Marine Engineering.*

DIESEL MARINE OIL ENGINES.—We are informed by Messrs. Swan, Hunter & Wigham Richardson, Limited, of Neptune Works, Walker-on-Tyne, that about twelve months ago, after careful investigation and consideration of various types of engines—oil, gas, electric, and other—they decided to build a vessel suitable for special service on the Canadian canals and lakes, and to fit her with two sets of Diesel oil engines. This vessel, the *Toiler*, is a twin-screw vessel, 248 feet between perpendiculars by 42½ feet beam by 19 feet depth moulded, propelled by two sets of two-cycle reversible Diesel engines of a combined brake horse-power of 360, equal to about 400 indicated horse-power working at about 250 revolutions. These engines were supplied by the Diesel Motor Company, of Stockholm, and fitted on board by Messrs. Swan, Hunter & Wigham Richardson, Limited, at their Neptune Works. On her voyage to Calais the *Toiler* was loaded with 2650 tons of dead-weight of coal cargo, besides 40 tons of oil fuel, fresh water and stores, a total dead-weight of nearly 2700 tons on a mean draft of 14 feet. She left the Tyne in very rough weather, notwithstanding which the engines worked perfectly satisfactorily, and completed her voyage to Calais at an average speed of 5.9 knots (or 6¾ miles). On her return voyage, light in ballast, the average speed was 8.2 knots (or 9½ miles). The consumption of oil fuel for the round voyage, including auxiliary compressor, was 6½ tons—say 1.65 to 1.75 tons per day. The *Toiler* has a large dead-weight capacity, owing to the fact that the Diesel engines are much lighter than steam engines and boilers, the amount in this vessel being about 60 tons; the cubic capacity for cargo is greater, as the boiler space is saved, and, besides, the oil fuel can be carried in the double bottom in place of water ballast, thus saving bunker space. The consumption of oil is much less in weight than the consumption of coal for steam engines. In the *Toiler* the consumption at full speed does not exceed 1.75 tons per day of oil fuel of 18,000 B. Th. U. calorific value, whereas with steam engines of equal power the consumption of coal would not be less than 8 tons per day. The actual difference in cost depends, of course, upon the relative prices of coal and oil in the district where the vessel may be trading. The deck machinery and engine-room accessories of the *Toiler* are driven by compressed air, supplied by a compressor driven by a small Diesel engine. The electric light with which the vessel is fitted obtains its power from a small paraffin engine. Messrs. Swan, Hunter & Wigham Richardson, Limited, have now taken up the construc-

tion of marine Diesel oil engines in their own Neptune Engine Works, and have at present a set of four-cylinder two-cycle engines in hand.—*Engineering.*

A paper of exceptional interest reproduced in the present issue was read at one of the meetings of the Institution of Naval Architects by Mr. J. T. Milton. Those who were present had the satisfaction of hearing an address on the engine by a no less authority than Dr. Diesel, who said that though the output of marine engines in comparison with the output of land engines was relatively small, he knew of 250 ships which were fitted or to be fitted with Diesel plants. The most important field had been supplied by the submarine boats, in which France took the lead some years ago.

The Diesel engine was now almost universally adopted for this kind of ship by the Admiralties of all nations except this country and the United States, both of which were just beginning. The number of Diesel submarine boats was about 150 of from 300 to 5000 horse-power. In the last two years the radius of action and the power of these boats had been so much increased that they were no longer merely defensive boats, but had become extremely dangerous offensive weapons on the high seas. Also there had been made a certain number of gunboats and very small cruisers, especially for Russia, while other types of vessels constructed had included tank-boats for the transport of oil, yachts, fighting boats, and a special ship for the North Polar expedition.

This year (continued Dr. Diesel) began the era of the large cargo-boats, such as the 9000-ton boat at Hamburg. If these succeeded there would be a certain evolution in shipbuilding, and the warships would follow very quickly. Already there was one battleship with Diesel engines in execution, as to which he was forbidden to say more.—*Page's Weekly.*

TWELVE MONTHS' EXPERIENCE WITH GEARED TURBINES IN THE CARGO STEAMER "VESPASIAN."—One year ago we reviewed a paper read before the Institution of Naval Architects by Hon. C. A. Parsons, descriptive of a system of mechanical gear for transmitting the power of marine steam turbines to low-speed propellers. The gear, of the double-helical type, with a ratio of 19.9 to 1, was installed in the tramp cargo steamer *Vespasian,* in which the original reciprocating engines were replaced by steam turbines. Our review dealt with the vessel and its machinery, and with the results of trial trips made off the Tyne in March of last year. We return to the subject now to present the results of twelve months' working of the geared turbines in actual service between the Tyne and the Continent, communicated to the Institution of Naval Architects by Mr. Parsons and R. J. Walker early in April.

"On completion of the trials referred to in last year's paper, the *Vespasian* was taken to sea on several occasions in light condition with a view to observing the behavior of the propelling machinery in a seaway. Although no very severe weather was encountered during these trials, sufficient evidence was obtained to show that the engines were not liable to race in heavy weather. A series of careful observations was made of the variation in revolutions of the engines with the vessel pitching. The governors on the turbines were so adjusted as to come into operation when the revolutions of the engines exceeded 1600, corresponding to eighty revolutions of the propeller shaft. Records were first taken at a normal rate of revolution of 72 on the main shaft. The vessel was put head to sea, and during a period of pitching the revolutions of the propeller shaft reached a maximum of 82 at the moment when the stern of the vessel had reached the maximum angle of longitudinal inclination, the immersion of the propeller under this condition being about 6 to 12 inches. The governors of the turbines came into action just as the maximum angle of inclination was reached.

"In regard to the question of economy generally, as mentioned in the reply to the discussion on last year's paper, we do not profess that the results obtained with the *Vespasian* are the highest obtainable with geared turbines. In a new vessel, and with new boilers, say, of about 180-pounds pressure, a consumption of about 12½ pounds to 13 pounds per shaft horse-power of the main engines, as compared with 16 pounds at the service speed of the *Vespasian*, could confidently be expected in an installation of, say, 1000 horse-power, which would be equivalent to 11½ pounds to 12 pounds per indicated horse-power of reciprocating engines, assuming a ratio of shaft horse-power to indicated horse-power of 91 to 92 per cent.

"In conclusion, it may be mentioned that the introduction of gearing into war vessels presents great advantages, since its adoption would result in increased economy, more especially at cruising speeds. In a large war vessel, say, having four shafts, the gearing of the highest pressure portion of the turbine to the low-pressure shafts in lieu of direct-coupled cruising turbines, effects a saving in consumption of fully 25 per cent, at a cruising speed equal to one-tenth of the full power, and 30 per cent at one fifteenth of the full power, giving corresponding increases in the cruising radius with the same quantity of coal."—*The Engineering Magazine.*

In an address at the Royal Institution on recent advances in turbines, the Hon. C. A. Parsons stated that the Turbinia Company was now constructing two 30-knot destroyers of 15,000 horse-power, wherein the high-pressure portion and cruising elements were geared in the ratio of 3 to 1 and 5 to 1 respectively to the main low-pressure direct-coupled turbine. Their use would increase the radius of action of the vessels at cruising speed to a very considerable extent over that of any similar destroyer without gearing. Similar gearing was proposed for warships, with similar prospective advantages.

The Westinghouse Machine Company has completed two marine turbines with reduction gears for use upon the U. S. collier *Neptune*. The turbine and equipment being installed up on the *Neptune* represent over five years of study and experiment in the works of the Westinghouse Machine Company in developing turbine machinery for the propulsion of ships. The tests of these units are regarded in marine circles as of great importance, owing to the small space occupied by the turbines, decreased weight, and to the fact that with the higher speed permissible by the use of reduction gears it is expected that the steam consumption will be from 20 per cent to 30 per cent less than that necessitated by any other form of marine propulsion.

MARINE DIESEL MOTORS.—A paper on the above subject was read at the annual meeting of the German Naval Architects by Direktor Saiuberlich, of Osterholz-Scharmbeck, near Bremen. According to *The Engineer*, Direktor Saiuberlich said that since the times of the old low-pressure engine the shipping world had never stood on the threshold of such far-reaching developments as at the present time. In place of the steam engine, a further improvement of which appeared hardly possible, the Diesel motor was now being installed as a marine engine. For fluid fuel the Diesel motor was the most perfect internal combustion engine of the present day. In recent experiments the utilization of the fuel had reached 33 to 35 per cent, as compared with 23 per cent in the gas engine and 13 per cent in the best steam-engine plant with superheater. This was a result of the direct use of the fuel in the cylinder without previous transformation, and of its consequent complete combustion. The construction of the Diesel motor was said to require material and workmanship of a very high class. These, however, were nowadays obtainable, and the difficulties on this head formerly experienced were overcome. Like the larger type of

gas engine the larger Diesel motor had very much the general appearance of the marine steam engine, on which it was more or less modeled. Now that several shipyards had shown that they could build the motors with the machinery already at their disposal, the prejudice against these engines would soon be overcome. Hitherto the motors had generally been of the single-acting description working on the four-cycle system. More recently the two-cycle engine had come to the front. The endeavors to apply the new system to the propulsion of large vessels had led to the application of double-acting motors of the two-cycle as well as of the four-cycle type. Such installations were now actually being made and would shortly be at work. The problem before the designer was to adapt the Diesel motor, that had worked satisfactorily on land, to the conditions on board a vessel, different in many respects and more difficult to meet, as these were. Moreover, the auxiliary machinery depended on the steam from the boilers, and a substitute for this had to be found. The advantages of the Diesel motor for the driving of vessels were the following: A gain in available space due to the removal of the boiler installation accompanying a reduction of that required for the new fuel; an increase in carrying capacity on account of the reduction in the weights of motive machinery and fuel; a posibility of using spaces formerly only partially available for the storing of the fuel; gains in time and wages due to easier and more rapid bunkering, coupled with the elimination of coal trimming; greater readiness for starting work; easier work for the engineers; abolition of stoking; greater cheapness of fuel; comparative coolness of the engine room; and greater radius of action for the vessel. Disadvantages were: The difficulty of obtaining fuel in many ports and the absence of steam for the deck machinery and for heating purposes. Herr Saiuberlich gave particulars of the first two Diesel motor vessel—the *Frerichs*, built for purposes of the shipyard, and the fishing vessel *Ewersand*, the engines for which, as well as the hulls, had been designed and built by Messrs. J. Frerich & Company, of Osterholz-Scharmbeck and Einswarden. The *Frerichs* was a single-screw vessel, built to the rules of the Germanischer Lloyd for the small coasting trade. She had been at work since the spring of this year in the towing service and in keeping up communication between the banks of the river. She had a reversible four-cylinder Diesel motor of 200 horsepower maximum, making 360 revolutions per minute. The motive medium here used was gas-oil, one ton of which was stored in two tanks under the cabin. This amount, which might easily have been doubled, gave the vessel a radius of action of 240 nautical miles at a speed of 9.5 knots. The vessel had a funnel for carrying off the gases. There was abundance of room owing to the small space required for the motive machinery. Reversing was effective by compressed air. A single movement of a lever in the desired direction of motion of the vessel moved the shaft so as to throw the machinery into gear in the manner required. This manipulation was very reliable and could be rapidly performed, if necessary, within a fraction of a second. A special arrangement of the compressor ensured the starting of the motor even if it stopped at a dead point. Cooling water and bilge pumps, which were driven from the crank-shaft of the motor, were fixed on the common bed plate. The hot exhaust gases from the cylinder were cooled with water in a double-walled elbow pipe. After being collected into a single pipe they were led into a large condenser, which deadened the noise, and then passed on to the funnel. The bilge pump was used for cooling the exhaust. The compressed air required for some of the maneuvers was produced by the motor itself in a two-stage compressor which formed the fifth cylinder of the installation. It was stored in six large compression vessels in the engine room at the side of the vessel. The air in these was used for starting. In the design of the motor the requirement had been made that there should be as few cylinders and other working parts and as little complications as possible. The adoption of the compressor had enabled the six cylinders otherwise re-

quired to be reduced to four, the compressor cylinder being used on occasion for starting the motor when the four-cylinder arrangement did not suffice to avoid the dead-point position. Care had to be taken to keep down expense, which in the construction of the Diesel motor was still a very important consideration. The bed plate was of cast iron and in one piece. The cylinder cover was the most important of the larger castings in the motor, because all the mountings required were attached to it, and great care had to be taken to avoid unnecessary strains in it. The ordinary case iron used for steam-engine work had been found to be the best material for the cylinder covers. The reversing gear was, in many respects, different from arrangements of the kind hitherto adopted. A horizontal shaft provided with two sets of cams and movable in its axial direction was fitted along the tops of the cylinders. The cams acted on valve levers and were thrown in or out of gear by the shifting of the shaft. The mechanical parts of the gearing were dealt with by the author in detail and illustrated by lettered sketches, from which it appeared that the cams effected the admission of fuel in either end position of the shaft, while there was a neutral position half-way between these. The actuating lever, arranged in the form of a hand wheel, admitted compressed air to the one or other side of the piston of a cylinder. The piston acted on a system of swinging levers, which moved the shaft above mentioned. A glycerine brake at the lower end of the compressed air cylinder provided against sudden jerks or uneasy motion in reversing. Arrangements were made by the admission of smaller amounts of fuel for driving the motor at "half-power" and "slowly," respectively. The air compressor, which, as already mentioned, took the form of a fifth cylinder with a crank on the main shaft arranged at an angle of 90° with those of the motor, so as to have turning power when the latter were at the dead-point position, could, in the latter case, be used for starting by the admission of compressed air into it from the storage tanks. Each working cylinder was provided with a pump which supplied it with the exact quantity of fuel required. For driving these only two eccentrics were necessary, since each of them actuated a double piston, and the pumps were combined in such a way that the regulation of one-half of them was effected from the other half. The body of the pump was of wrought iron in each case. The regulation was effected by means of a simple governor; or it could be done by hand, in which latter case the governor was merely a safeguard against racing of the engine. In connection with diagrams which were shown the lecturer pointed out that in the case of quickly running motors the combustion could not be so complete as in that of slowly running ones, and that the combustion and expansion periods ran into one another. The *Frerichs* had been at work for a considerable time with good results, and after careful investigations made with her the insurance companies had agreed to a premium at the ordinary rate. The full speed of 10 knots could be reduced to 3.8 knots, the revolutions per minute thereby falling from 360 to 150. The reduction could be effected either by cutting out some of the cylinders or by supplying smaller quantities of fuel to all of them. Experiments with the reversing gear showed that the lever could be put over in less than a second. The time required for reversing the motor when running at full speed was 8 seconds; while the vessel herself began to go astern after about 27 seconds. The diameter of the turning circle of the vessel was about one and a-half times her length.

The lecturer then directed attention to the Diesel motor fishing boat *Eversand*, and said that the introduction of the crude oil motor into the fishing industry was an event of first-rate importance. He looked forward to the time when the German fish market would be entirely supplied by means of cheaply worked German motor fishing boats, instead of, as at present, having to draw its supplies largely from abroad. Towards the end of October this vessel had returned from a trial fishing cruise of five weeks, during which time she had not used more than three tons of crude oil,

in place of the 20 tons of coal which a steam vessel of the same size would have required. It was anticipated that this amount could be still further reduced. The fishing winches, which might easily have been driven from the motor, were, as a matter of precaution for the first cruise, served by a small donkey boiler. The fuel was stored in a fixed tank in the engine room, and the small space occupied by it would have been useless for other purposes. The stowing of part of the fuel in the herring-barrels now became unnecessary. The use of crude oil at sea was found to be in every respect reliable, and it was considered as certain that the motor would take the place of the steam engine in fishing vessels. The design was for the most part similar to that in the *Frerichs*. The high-speed two-cylinder motor developed 80 to 90 effective horse-power with 330 revolutions. Reversing was effected by means of a friction coupling and gear. This enabled the motor to be of extremely simple design, and to have relatively few cylinders, which, for the hard usage it would get in a fishing boat, was of great importance.

Herr Saiuberlich gave some further particulars that were not contained in the printed pamphlet distributed. In the course of a comparison of designs for a vessel for shipyard work with a Diesel motor and with a steam engine, it appeared that, with a given output of 100 horse-power, 11½ feet of length of hull and one stoker could be saved by the adoption of the new motor. A herring boat of 164 tons, with a steam engine, was found to be capable of doing only the same work as a vessel of the same kind of 140 tons with a Diesel motor. In a trawler, the substitution of a Diesel motor for a steam engine increased the length of the available hold by 13 feet. In a vessel of 5400 tons for the Black Sea trade, 15,000 cubic feet were added to the hold space by the adoption of a Diesel motor. Assuming the vessel to make four voyages a year, this was equivalent to a profit of $4380 (£900); the saving in fuel due to the Diesel motor for these voyages was $2677 (£550), and about $1168 (£240) in wages. In view of these facts, the author was of opinion that the applicability of the Diesel motor to ships was very great.—*International Marine Engineer.*

MISCELLANEOUS.

In reply to a question in the House of Commons, Mr. Haldane stated that the German Army has nine complete dirigibles, but no official information as to further orders is available. The French Army has four dirigibles complete and eight in various stages of construction. The Russian Army has nine dirigibles complete, one building, and four on order. As regards aeroplanes, no definite information is available as to Germany, as that government has adopted a policy of subsidy in respect of them. As regards France, nearly seventy aeroplanes are in possesion of the government, but as to further orders no information is to hand. As regards Russia, it is understood that ten aeroplanes are available for use, and that twenty are on order. The figures as to financial provision for aeronautical work are as follows:

Germany.

1909—Expenditure	£54,231
1910—Estimate	£400,000

(including Zeppelin Subscription Fund, £305,000).

France.

1909—Expenditure	£108,500
1910—Expenditure	£126,650

These figures include pay of personnel, etc., upkeep of laboratory, depots, etc.

Russia.

1909—Estimate	£103,020
1910—Estimate	£183,820

With regard to training for aeronautical work, nine officers and 108 non-commissioned officers and men who are trained, or are in course of trainin, are now with the air battalion at Aldershot. There are also a number of officers of Royal Engineers and men who have been trained in captive ballooning and kiting. The establishment of the air battalion consists of fourteen officers and 176 other ranks, and their pay and upkeep for the year 1911-12 will amount to about £20,000, which is provided under the several votes concerned. The training of officers and men in aeronautical work is proceeding. No definite duration of course has yet been fixed, but officers joining are placed on probation for six months.

WIRELESS ON AEROPLANE.—Experiments with wireless telegraphy from aeroplanes are being carried out in France, and one of the first to be successful was made at the Buc aeronautic grounds on board an aeroplane piloted by Maurice Farman, using wireless apparatus of the Ancel type. In the first experiments there was used a 4-inch spark coil supplied by four storage battery cells. One pole of the spark gap was connected to the steel-brace wires and all the metallic mass of the aeroplane and the second pole to an aerial wire which was well insulated. This aerial was composed of two 0.04-inch copper wires hanging down parallel to each other and 150 feet long, suspended in the rear of the aeroplane. During the flight, the wires took an almost horizontal position. The total weight of the wireless outfit is 45 pounds. In the present tests M. Farman did not carry a passenger, but worked the apparatus himself. Signals were received in the aerodrome shed, using an aerial stretched along horizontally for 600 feet length and mounted on 25-foot poles. The aeroplane flew at 8 miles from the shed and the signals were always well received, using a Ferrié electrolytic detector. New experiments are being made so as to increase the range, using an 8-inch spark and a 300-foot aerial. A passenger mounted on board works the apparatus.—*Electrical World.*

"TITANIC" LAUNCHED.—The giant White Star steamship *Titanic*, a sister ship to the big *Olympic*, was launched on May 31 from the yards of Harland & Wolff in the presence of thousands of spectators.

The *Titanic* is of 45,000 tons register and 66,000 tons displacement. She is 886½ feet long and 92½ feet beam. She will carry 3000 passengers, 600 in the saloon, 500 in the second cabin and 1900 in the steerage, and this number can be increased if the company should desire to carry less cargo and more steerage passengers. The vessel carries a crew of 860 men.

THE FORTIFICATIONS OF FLUSHING.—Recently there appeared in the *Vingtième Siècle* a very important article on the Flushing question, in which the writer says that the fortification of that place would be the surest means of barring the approach to the Scheldt, and would prove most dangerous to Belgium. Antwerp would be cut off from the sea, and if Belgium were invaded and became herself belligerent, the Netherlands, interpreting strictly the clauses of the Declaration of London, might prevent any vessels carrying stores which could be considered contraband from entering the river, while the conveyance of supplies and military stores from Ostend and Zeebrugge by rail would seriously compromise the duties of the railway in the work of mobilization. Moreover, Belgium must take account of the possibility of the line being cut by an enemy throwing ashore a raiding party from his fleet, while the army was driven into Antwerp, increasing by 100,000 the number of mouths to be filled. The conclusion is that, for the good of both countries, the real interest of Belgium and the Netherlands is to enter into friendly relations, and put an end to the incertitude that exists. A scheme put forward by the octogenarian General Dejardin in the *Journal des Intérêts Maritimes*, is that Belgium should make of Brussels and Antwerp a fortified position, behind which the Belgian forces could mobilize on the Dyle. The general

urges military expansion and training, and hopes to see 500,000 Dutch Belgians menacing the flank of an army advancing by the right bank of the Meuse, the Belgians extended from Nivelle on the right, by Ottignies-Wavre to Louvain, and the Dutch on the line of Utrecht, with their right at the junction of the Meuse and the Rhine. Flushing may be fortified, he says, but there must be understanding with the Netherlands.—*Army and Navy Gazette.*

RESULTS OF TRIALS OF ANTI-ROLLING TANKS AT SEA.—At the spring meetings of the Institution of Naval Architects in April an interesting paper on the results of trials of anti-rolling tanks at sea by Herr H. Frahm was read, detailing the experiments carried out by this gentleman at the shipbuilding yard of Messrs. Blohm & Voss, of Hamburg, and on ships fitted with his device. The author opens his paper with the historical fact that the employment of free water in the hull for damping rolling motion was not new, as the old ironclad *Inflexible* had a parallel-sided athwartship chamber partly filled with water, and though the trials of these tanks in the Mediterranean proved their efficiency the trials were not repeated, owing to the impossibility of mastering the water rushing freely from side to side in the tank. Further the tank occupied valuable space which could be far better otherwise employed. The author's arrangement has been devised on the theory of resonance, by which bodies that can oscillate about a condition of equilibrium are made to swing severely under comparatively small impulses as soon as the period of oscillation of the impulse is synchronous with the individual periods of the respective bodies. It can be demonstrated that the phases of oscillation of the body and of the impulse are deferred by 90°. A ship constitutes a body of this kind, as she will oscillate under the impulse of the waves and will roll in her individual number of oscillations, even if the impulse be more or less irregular. Large heeling amplitudes can only be produced on a ship if she is struck by a series of comparatively regular waves, and struck in the measure of her individual number of oscillations. Under such circumstances the influence of resonance will be promptly felt, and there will be an increase of the angle of heel from wave to wave. The author's device has been based on this fact, as it uses a secondary and artificial resonance in order to annihilate the influence of primary resonance between waves and ship. This effect is produced by means of a U-shaped tank located athwartship, and extending from side to side, in which a water column can oscillate with the same number of swings per minute that are peculiar to the ship herself. The tank consists of three parts, the vertical portions at the two sides and the connecting portion; the water fills the latter completely and the former about half-way up. The dimensioning of the tank determines the period of oscillation and must be carefully calculated. As the phases of the impulse of waves and ship are deferred by 90° the ship lays a quarter of her full period behind the wave, or, in other words, the ship arrives at the heeling climax a quarter of a period later than the wave, in its advancing movement, arrives at its maximum slope towards the ship. The same law applies to the rolling of the ship, and the oscillating movement of the tank-water produced by the former, so that the tank-water will reach its highest or lowest level in the vertical parts of the tank a quarter of a period later than the greatest heeling of the ship to one side or the other. The result is that there is a total difference of 180° between the impulse of the waves and the oscillations of the tank-water, and the effect of one is in the opposite direction to the other and thus they neutralize one another. As illustrating the practical result of the theory, tanks have been fitted to two steamers of 14,000 tons loaded displacement, 447 feet length and 55 feet beam, and some interesting effect were obtained with the tanks in and out of action. Each ship has two sets of tanks, one fore and one aft, placed at the mast positions between the existing loading hatches on the uppermost deck, and each set consists of two tanks, 9 feet

high, 10 feet athwartship breadth, and a length of 25 feet, the two tanks being connected by a connecting portion, 1 feet 6 inches high, carried over the deck. Air connections provided with valves are arranged for throttling or entirely cutting off the connection, which will regulate or stop the motion of the tank-water. The total weight of water in each tank is 94 tons, and the turning movement exerted by all the tanks in full action is 2790 feet tons. In the trials, one one occasion, a heeling angle of 11° on both sides with an undamped ship was reduced to from 2° to 2½°, and on another occasion an estimated heeling angle of 25° was reduced to an average heeling angle of from 4° to 5°. It will be conceded the results are very promising, particularly in view of the markedly favorable effect on the health of the passengers reported, and of the fact that these ships, which had previously been unsteady and much given to rolling, had become, through the addition of the tanks, quiet, comfortable vessels. We congratulate Herr Frahm on his able treatment of a subject that has laid dormant since the *Inflexible* experiment, and on the result which his thorough investigation of the subject has enabled him to carry out with predetermined accuracy.—*The Marine Engineer.*

If ever the term "superlative" was justified in speaking of engineering works of magnitude, we may surely make use of it in connection with the recent opening of the new graving dock at Belfast, Ireland, by the admission into the structure of the White Star liner *Olympic*, when the greatest ship in the world was safely berthed in the world's greatest masonry dry dock. The dock was constructed through the foresight and enterprise of the local authorities of the Belfast harbor.

The main contract for the work was entered into late in the year 1903, and active work was commenced early in 1904. During the intervening seven years a large force of men has been continually at work, and the magnitude of the operations may be judged from the fact that upward of 300,000 cubic yards of sand and clay had to be removed, and that in the excavation thus made there has been formed a water-tight masonry basin nearly 900 feet long and 100 feet wide, into the construction of which entered 76,000 cubic yards of concrete, 24,000 cubic yards of brickwork, and 36,000 cubic yards of cut granite. The contract called for the completion of the work in three years and four months from the date on which construction began; but two serious subsidences in the large Alexandra graving dock alongside delayed the work, so that about seven years altogether have been occupied in the construction. The Alexandra dock, one of the largest in the world, is 80 feet wide at the entrance, 50 feet board on the floor; with a floor length of 800 feet. The new dock is 96 feet wide at the entrance, 100 feet wide on the floor, and 850 feet long on the floor when the caisson gate is placed in its normal position at the entrance. By floating the gate out and placing it against the outer face of the dock entrance, the total length on the floor is 887½ feet.

In view of the constantly increasing length of ocean liners, the construction of the dock has been carried out in such a way as to permit of the permanent lengthening of the structure to the extent of 200 feet. Whenever this is done, a normal length of clearance will be available of 1050 feet, sufficient to comfortably accommodate the much-talked-of 1000-foot ship of the future.

The following further particulars will be of interest: The width at the coping level is 128 feet, and at the lowest altar course 104 feet 6 inches; the depth of floor at center below level of high water of ordinary spring tides is 37 feet 3 inches; the top of keel blocks below level of high water of ordinary spring tides is 32 feet 9 inches; height of top of blocks above floor, 4 feet 6 inches; level of entrance sill above floor at center of dock, 2 feet; bottom of floor at sides of dock below coping level, 43 feet 6 inches; thickness of floor at center, 17 feet 6 inches; thickness of side walls at bottom of battened face, 18 feet 9 inches.

The emptying of a dock of this huge size calls for a powerful pumping plant, and three engines, each of 1000 horse-power, working together, are able to pump the dock dry in one hour and forty minutes, even when there is no vessel in the dock. To do this necessitates drawing out about twenty-three million gallons of water. The auxiliary plant is built on the same generous scale. Thus, the hydraulic capstan equipment consists of three, each of 30 tons capacity, and two of 11 tons—big units, it is true, but none too large for handling ships of the size of the *Olympic* and *Titanic*. The next largest capstans are found at the Admiralty yards, each of which is only 16 tons capacity.

The old system of hinged swinging entrance gates is no longer used on modern dry docks of large capacity, their place being taken by floating steel caissons. The gate for the new dock is a massive rectangular structure, which, when the dock is open, is contained in a recess on the west side of the entrance. It travels upon two lines of heavy rollers, set on the floor of the dock, and is moved across the entrance by special hydraulic appliances, the opening or closing being done in about five minutes' time. When a vessel as long as the *Olympic* is to be docked, the caisson is floated out and placed against the granite faces of the outer entrance sill, thereby adding 37½ feet to the normal length of the dock. On the floor of the dock, along its central longitudinal line, are 332 massive cast-iron keel blocks, with timber capping pieces. These blocks receive the entire weight of 38,000 tons of a vessel like the *Olympic*, when they carry her huge bulk without the least injurious strain upon the ship's structure. It may be mentioned that the overall length of the *Olympic* is 882½ feet, its breadth 97 feet 4 inches, and its gross tonnage, 45,000.—*Scientific American.*

THE DECLARATION OF LONDON ASSURED.—The approval of the Declaration of London by the Imperial Conference, sometimes called the Colonial Conference, seems to settle the question whether the Declaration, which contains a set of rules for the guidance of the International Prize Court, will be ratified by England. There have been, and there will continue to be, honest differences of opinion about the effect of these rules upon the welfare of England when engaged in war. That the rules will work to her advantage when she is a neutral cannot seriously be disputed.

Critics of the Declaration, which was drawn up by delegates from Great Britain, France, Germany, the United States, Japan, Russia, Italy, Austria and Holland in February, 1909, have generally maintained that England would be delivered into the hands of Germany in the event of war with that country if the Declaration were ratified by England. Mr. H. W. Wilson, the naval expert, in bitterly assailing it, has used this language in a recent issue of the *National Review:*

"We allow the destruction of our ships when other powers are at war; we imperil our food supplies; we expose our commerce to the deadliest form of attack; we hamper our fleets; we abandon the rules and laws of our own prize courts, with their six centuries of maritime experience and their high standard of justice and humanity, for a new code made in Germany, inferior in humanity and equity; on every vital point we surrender our contentions; and we treat the dominions as though they were of less account than Persia, Colombia and Uruguay. A nation which accepts such a code deserves to become the 'rich, but defenceless prey' of peoples who will not sell their destiny for a mess of pottage. The Declaration of London is a lamentable proof that the spirit of *Pitt* and *Palmerston* has disappeared from British diplomacy."

But is it as bad as all that? The fear that England's food supply would be cut off in case of war is prompted by the clause in the Declaration that allows foodstuffs carried in neutral bottoms to be seized by the enemy's ships, that is to say foodstuffs consigned to or intended for the army and navy, which thus become contraband. It would be a question of evidence, which no doubt a rival sea power would construe to suit itself, with the understanding, however, that the case would go on appeal to the Interna-

tional Prize Court. It has been pointed out that the sum of England's food supply carried in neutral ships is comparatively small. The bulk of foodstuffs is carried in British ships, and if the British Navy could not protect them the supplies brought by neutral ships, even if all of them escaped the enemy, would not save England from the humiliation of making peace on the enemy's terms.

The Declaration of Paris, which that of London is to supplant, abolished privateering. There is nothing in the proposed rules to prevent the conversion of a merchant steamer into a man-of-war on the high seas, the question having been left open. But the omission would work to the advantage of England herself, for what other nations has so great a tonnage of fast merchant ships in the Seven Seas? Moreover, what other nation has so many fleet and powerful cruisers to overhaul privateers preying on the commerce?

As to contraband, its character will be settled for the first time. Such and such articles will be contraband outright; some raw materials, foodstuffs, cloths, fuel, etc., will be conditional contraband; and there will be a "free list" of articles that can be imported under a neutral flag, among them raw materials necessary in British industry and representing about one-third of all imports. Hitherto each nation has decided for itself what was contraband, the law of nations being evoked or ignored as occasion arose

A great outcry has been made about the so-called restriction of the zone of blockade, that is to say a blockade must be thoroughly effective to be recognized; but it has been well said that Articles 1 to 21 of the Declaration dealing with this question represent British naval opinion on the subject as it has been maintained for a hundred years. Moreover, the blockade rules were proposed by the British delegates. Other objections have been urged to the terms of the Declaration, but the most weighty we have outlined. There is no doubt that behind the opposition is a conviction that Germany is already a formidable trade and naval rival to England, and that in the event of war Germany would prove a ruthless belligerent in spite of the Declaration. But it was not made for the benefit of England alone; it was made for the good of all maritime nations, and particularly for the welfare of neutrals and to prevent war by referring grievous seizures at sea and the destruction of neutral ships to the International Prize Court for final adjudication. With the most powerful navy and the greatest mercantile marine in the world, England has resources enough to maintain the ascendency of both and to protect her food supply in time of war from the ravages of any rival sea power, even Germany.

The Declaration of London was very much of England's making and she should abide by the worg of her delegates. It is not a perfect document, and as it stands it would make the cost of a war with Germany a formidable thing to consider; but the war would also be costly to Germany; and the realization ought to act as a deterrent to both. In short, if England maintains the double naval standard, as she proposes to do, she has nothing to fear from the Declaration of London when she is a combatant. As a neutral she should greatly profit by it.—*New York Sun.*

NEW FRENCH UMPIRE REGULATIONS.—The French have taken the umpire question very seriously in hand. They consider that army maneuvers are valuable principally for the training which they afford to generals and commanding officers, and that the instruction of the individual soldier must on these occasions be subordinated to that of his superiors. If the soldier is put out of action by an umpire, he derives no further instruction from the day's fight; if a battalion is stopped when it attempts an impossible advance under fire, the successful assault with which the day's proceedings were intended to conclude may never come off. But, on the other hand, the commanding officers will learn to appreciate the realities of war, and farcical situations will be avoided. The new French regulations provide for an efficient and complete service of umpires. These are

not to be permanently attached to particular units, but are to be kept together until battle is joined under the senior umpire of the side. This functionary then allots his staff to the units in the fighting line, and arranges a service of communication both with them and with the umpires on the opposite side. For this he is well provided with the necessary means, which include motor cars, motor bicycles, numerous orderlies, and a telegraph section, which also establishes heliograph stations. The Chef d'Arbitres, or chief umpire of the maneuvers, has, in addition, a wireless section for communication with the senior umpires. The great difficulty which the junior umpires have to contend with at our own moneuvers is that they have no means of knowing what fire is being directed on the units which they are accompanying. This difficulty is fully appreciated by the French, and they have adopted the only means of overcoming it—namely, a complete system of communication between umpires on opposite sides at every point of the line of battle.—*Army and Navy Gazette.*

The American Red Cross announces, in connection with the International Conference of the Red Cross which will be held at Washington, D. C., in May, 1912, that the Marie Feodorovna prives will be awarded.

These prizes, as may be remembered, represent the interest on a fund of 100,000 rubles which the Dowager Empress of Russia established some ten years ago for the purpose of diminishing the sufferings of sick and wounded in war. Prizes are awarded at intervals of five years, and this is the second occasion of this character. These prizes in 1912 will be as follows:

1 of 6000 rubles.
2 of 3000 rubles each.
6 of 1000 rubles each.

The subjects decided upon for the competition are:

(1) Organization of evacuation methods for wounded on the battle field, involving as much economy as possible in bearers.

(2) Surgeon's portable lavatories for war.

(3) Methods of applying dressings at aid staions and in ambulances.

(4) Wheeled stretchers.

(5) Support for a stretcher on the back of a mule.

(6) Easily portable folding stretcher.

(7) Transport of wounded between men-of-war and hospital vessels, and the coast.

(8) The best method of heating railroad cars by a system independent of steam from the locomotive.

(9) The best model of a portable Röntgen-ray apparatus, permitting utilization of X-rays on the battle field and at the first aid stations.

It rests with the jury of award how the prizes will be allotted in respect to the various subjects. That is to say, the largest prize will be awarded for the best solution of any question irrespective of what the question may be.

Further information may be obtained by addressing the Chairman, Exhibit Committee, American Red Cross, Washington, D. C.

A BATTLESHIP NAMED AFTER A STATE IS THE ONLY NAVAL UNIVERSITY OF THAT STATE.—At the alumni dinner of naval graduates June 1, 1911, Mr. Satterlee, of New York, made a very strong appeal for all friends of the navy to emphasize the fact that the navy is really and chiefly an advanced educational institute of applied science.

A modern battleship is a most intricate and highly developed instrument of precision and it requires the highest scientific education and training for handling it most efficiently. Each state in the Union has or will have a battleship bearing its name and officers and men prefer service in the ship named from the State in which they live. It is impossible for the States to maintain naval colleges and here each State has such a college—a naval university bearing the name of the State.

way that any who has had experience with the propelling apparatus of a ship can understand the principles explained and the machines described.

Nearly one-half of the book treats of refrigeration, and the underlying principles of the various methods are set forth. The advantages and disadvantages of these methods are given.

The subject of the design and care of the cold rooms is gone into very thoroughly; this should be of great interest to those who are responsible for cold storage plants aboard ship. Frequently a fault in the storage boxes is looked for in the machine.

"About one-third of that part of the book which deals with cold storage is devoted to a discussion of 'faults' which may occur in the apparatus. Directions are given for hunting down various troubles and repairing them, and what is more important, explicit instructions are given for operating various types of plants so as to avoid breakdowns." It should be an easy matter after a study of this section of the book to tabulate the likely faults and their remedies, of any installation, under the following headings: "Faults," "How Discovered," "How Remedied," as is frequently done in case of electric plants aboard ship.

Quoting from the book: "There is nothing in cold storage apparatus that the marine engineer who knows his work will not be able to master, if he puts his mind into it, and if he will remember the differences between the freezing apparatus and the steaming apparatus. There is a great similarity between the two in many respects, and on the other hand, there are some very wide and important differences that must be remembered, if the plant is to be kept going satisfactorily. A cold storage plant is very much in the nature of a steam plant reversed. The cold store itself, or the brine tank, or the air-cooling apparatus, or whatever may receive 'cold' from the expansion coils, stands very much in the same relation to the whole plant as the boiler does to the steam plant." Wherever possible, contrasts are drawn between the steam and refrigerating plants, making this part of the book particularly interesting and valuable to those sea-going engineers who wish to familiarize themselves with marine refrigerating plants.

The second and third sections take up the subjects of heating and ventilation respectively. The improvements from the stove and open fire up to steam and hot water and indirect heating have been followed by the same methods aboard ship. Electric heating is now used a great deal on shore because of its handiness, notwithstanding the fact that it is more expensive. The cost should be less aboard ship and undoubtedly this method will replace those now in use.

The thermotank system as used on the S. S. *Lusitania* is somewhat complicated. The feature of it that combines the ventilating and heating or cooling of the various compartments is ideal. The author has given a complete description of this system. He has also worked out a design for an electric heating plant for a large passenger steamer (*Kaiser Wilhelm der Grosse*), including the cost of operating under various conditions. Types of electric heaters, steam and hot-water radiators, their advantages

and disadvantages for ships' use are discussed from a practical viewpoint. Sketches and diagrams show details of the various apparatus.

The well-known principle of ventilation is, that there shall be a circulation of air from a fresh-air inlet, through the spaces to be ventilated, to a foul-air outlet at a low enough velocity to prevent drafts. The inlet and outlet should be large enough to allow frequent changes of air. This subject is treated by the author in the same general way, setting forth the principles of ventilation, describing the apparatus used and the method of running it.

The book as a whole is not only valuable to those who operate plants, but to the man who has to improve existing installations or design new ones. 8vo. 269 pages. 71 illustrations. Cloth binding. Price, $2.00 net. The D. Van Nostrand Company. W. B. WELLS.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CUIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-eighth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1912.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1912. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.

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HONORABLE MENTION.

NAVAL POWER.

By REAR-ADMIRAL BRADLEY A. FISKE, U. S. Navy.

Motto: *"Sleepers, Wake."*

NOTE.—The enormous increase in the power of navies that has taken place within the past ten years, with the corresponding relative decrease in the power of armies, constitute a phenomenon whose causes and whose characteristics are only vaguely understood. To many it seems based on some mistake, and to it the phrase "craze for naval armaments" is frequently applied. The present paper is the outcome of an effort by the writer to discern what fundamental property has enabled navies to increase so tremendously in their power, and why the nations spend so much money utilizing it; and also to find some simple truths, to help us develop naval power still further.

Mahan proved that sea power has exercised a determining influence on history. He proved that sea power has been necessary for commercial success in peace and military success in war. He proved that, while many wars have culminated with the victory of some army, the victory of some navy had been the previous essential. He proved that the immediate cause of success had often resulted inevitably from another cause, less apparent because more profound; that the operations of the navy had previously brought affairs up to the "mate in four moves," and that the final victory of the army was the resulting "checkmate."

Before Mahan proved his doctrine, it was felt in a general way that sea power was necessary to the prosperity and security of a nation. Mahan was not the first to have this idea, for it had been in the minds of some men, and in the policy of one nation, for more than a century. Neither was Mahan the first to put forth the idea in writing; but he was the first to make an absolute demonstration of the truth. Newton was not the first man to know, or to say, that things near the earth tend to fall to the earth; but he was the first to formulate and prove the doctrine of universal gravitation. In the same way, all through history, we find that a few master minds have been able to group what had theretofore seemed unrelated phenomena, and deduce from them certain laws. In this way they substituted reasoning for speculation, fact for fancy, wisdom for opportunism, and became the guides of the human race.

The effect of the acceptance of Mahan's doctrine was felt at once. Realizing that the influence of sea power was a fact, comprehending Great Britain's secret, after Mahan had disclosed it, certain other great nations of the world, especially Germany, immediately started with confidence and vigor upon the increase of their own sea power, and pushed it to a degree before unparalleled; with a result that to-day must be amazing to the man who, more than any other, is responsible for it.

Since the words "sea power," or their translation, is a recognized phrase the world over, and since the power of sea power is greater than ever before, and is still increasing, it may be profitable to consider sea power as an entity, and to inquire what are its leading characteristics, and in what it mainly consists.

There is no trouble in defining what the sea is, but there is a good deal of trouble in defining what power is If we look in a dictionary, we shall find a good many definitions of power; so many as to show that there are many different kinds of power, and that when we read of "power," it is necessary to know what kind of power is meant. Clearly "sea power" means power on the sea. But what kind of power? There are two large classes into which power may be divided, passive and active. Certainly we seem justified, at the start, in declaring that the power meant by Mahan was not passive, but active. Should this be granted, we cannot be far from right if we go a step further, and declare that sea power means ability to do something on the sea.

If we ask what the something is that sea power has ability to do, we at once perceive that sea power may be divided into two parts, commercial power and naval power.

The power exerted by commercial sea power is clearly that exerted by the merchant service, and is mainly the power of acquiring money. It is true that the merchant service has the power of rendering certain services in war, especially the power of providing auxiliary vessels, and of furnishing men accustomed to the sea; but as time goes on the power contributable by the merchant service must steadily decrease, because of the relatively increasing power of the naval service, and the rapidly increasing difference between the characteristics of ships and men suitable for the merchant service and those suitable for the naval service.

But even in the past, while the importance of the merchant service was considerable in the ways just outlined, it may perhaps be questioned whether it formed an element of sea *power*, in the sense in which Mahan discussed sea power. The power of every country depends on all the sources of its wealth; on its agriculture, on its manufacturing activities, and even more directly on the money derived from imports. But these sources of wealth, and all sources of wealth, including the merchant service, can hardly be said to be elements of power themselves, but rather to be elements for whose protection power is required.

In fact, apart from its usefulness in furnishing auxiliaries, it seems certain that the merchant service has been an element of *weakness*. The need for navies arose from the weakness of merchant ships and the corresponding necessity for assuring them safe voyages and proper treatment even in time of peace; while in time of war they have always been an anxious care, and have needed and received the protection of fighting ships, that have been taken away from the fleet to act as convoys.

If commercial sea power was not the power meant by Mahan, then he must have meant naval power. And if one reads the pages of history with patient discrimination, the conviction must grow on him that what really constituted the sea power which had so great an influence on history, was *naval* power; not the power of simply ships upon the sea, but the power of a navy composed of ships able to fight, manned by men trained to fight, under the command of captains skilled to fight, and led by admirals

determined to fight. Trafalgar was not won by the merchant service; nor Mobile, Manila or Tsushima.

CHARACTERISTICS OF NAVAL POWER.

If sea power be essentially naval power, it may be interesting to inquire: In what does naval power consist and what are its principal characteristics?

If one looks at a fleet of warships on the sea, he will be impressed consciously or unconsciously, with the idea of power. If he is impressed consciously, he will see that the fleet represents power in the broadest sense; power active, and power passive: power to do, and power to endure; power to exert force, and power to resist it.

If he goes further and analyzes the reasons for this impression of power, he will see that it is not merely a mental suggestion, but a realization of the actual existence of tremendous mechanical power, under complete direction and control.

In mechanics we get a definition of power, which, like all definitions in mechanics, is clear, definite and correct. In mechanics, power is the rate at which mechanical work is performed. It is ability to do something in a certain definite time.

Now this definition gives us a clear idea of the way in which a navy directly represents power, because the power which a navy exerts is, primarily, mechanical; and any other power which it exerts is secondary, and derived wholly from its mechanical power. The power of a gun is due wholly to the mechanical energy of its projectile, which enables it to penetrate a resisting body; and the power of a moving ship is due wholly to the mechanical energy of the burning coal within its furnaces.

It may be objected that it is not reasonable to consider a ship's energy of motion as an element of naval power, in the mechanical sense in which we have been using the word "power," for the reason that it could be exerted only by the use of her ram, an infrequent use. To this it may be answered that energy is energy, no matter to what purpose it is applied; that a given projectile going at a given speed has a certain energy, whether it strikes its target or misses it; and that a battleship going at a certain speed must necessarily have a certain definite energy, no matter whether it is devoted to ramming another ship or to carrying itself and its contents from one place to another.

Besides the mechanical power exertable by the mere motion of the ship, and often superior to it, there is the power of her guns and torpedoes.

Perhaps the most important single invention ever made was the invention of gunpowder. Why? Because it put into the hands of man a tremendous force, compressed into a very small volume, which he could use instantaneously, or refrain from using at his will. Its first use was in war; and in war has been its main employment ever since. War gives the best field for the activity of gunpowder, because in war we always wish to exert a great force at a definite point at a given instant; usually in order to *penetrate* the bodies of men, or some defensive work that protects them. Gunpowder is the principal agent used in war up to the present date. It is used by both armies and navies; but navies give the larger field for its employment.

Of course this does not mean that it would be impossible to send a lot of powder to a fort, more than a fleet could carry, and fire it; but it does mean that history shows that forts have rarely been called upon to fire much powder, and that their lives have been peaceful. And all the indications of the future seem to show that, while the great preventive value of forts will continue to be recognized, yet nevertheless forts will actually fire powder even less in the future than in the past, for the reason that they fulfil their purpose so perfectly that ships will keep away from them.

Leaving forts out of consideration for a moment, and searching for something else in which to use gunpowder on a large scale, we come to siege pieces, field pieces, and muskets. Disregarding siege pieces and field pieces, because there are so few of them, and they not very big, we come to muskets.

Now the musket is an extremely formidable weapon, and has, perhaps, been the greatest single contributor to the victory of civilization over barbarism, and order over anarchy, that has ever existed up to the present time. But the enormous advances in engineering, including ordnance, during the last fifty years, have reduced enormously the relative value of the musket. Remembering that energy, or the ability to do work, is expressed by the formula: $E = \frac{1}{2}MV^2$, remembering that the projectile of the modern 12-inch gun starts at about 2900 f. s. velocity and weighs 867 pounds, while the bullet of a musket weighs only 150 grains and starts with a velocity of 2700 feet per second, we

see that the energy of the 12-inch projectile is about 47,000 times that of the bullet on leaving the muzzle. But after the bullet has gone, say 5000 yards, its energy has fallen to zero, while the energy of the 12-inch projectile is nearly the same as when it started.

While it would be truthful, therefore, to say that the energy of the 12-inch gun within 5000 yards is greater than that of 47,000 muskets, it would also be truthful to say that outside of 5000 yards, millions of muskets would not be equal to one 12-inch gun.

Not only is the 12-inch gun a weapon incomparably great, compared with the musket, but when placed in a naval ship, it possesses a portability which, while not an attribute of the gun itself, is an attribute of the combination of gun and ship, and a distinct attribute of naval power. A 12-inch gun placed in a fort may be just as good as a like gun placed in a ship, but it has no power to exert its power usefully unless some enemy comes where the gun can hit it. And when one searches the annals of history for the records of whatever fighting forts have done, he finds that they have been able to do very little. But a 12-inch gun placed in a man-of-war can be taken where it is needed, and recent history shows that naval 12-inch guns, modern though they are, have already done effective work in war.

Not only are 12-inch guns powerful and portable, but modern mechanical science has succeeded in so placing them in our ships that they can be handled with a precision, quickness, and delicacy that have no superior in any other branch of engineering. While granting the difficulty of an exact comparison, the writer feels no hesitation in affirming that the greatest triumph of the engineering art in handling heavy masses is to be found in the turret of a battleship. Here again, and even inside of 5000 yards, we find the superiority of the great gun over the musket, as evidenced by its accuracy in use. No soldier can fire his musket, even on a steady platform, himself and target stationary, and the range known perfectly, as accurately as a gun-pointer can fire a 12-inch gun; and if gun and target be moving, and the wind be blowing, and the range only approximately known, as is always the case in practice, the advantage of the big gun in accuracy becomes incomparable.

But it is not only the big projectile itself which has energy,

for this projectile carries a large charge of high explosive, which exploding some miles away from where it started, exerts a power inherent in itself, that was exhibited with frightful effect against the Russian ships at the battle of Tsushima.

This brings us to the auto-torpedo, a weapon recently perfected; in fact not perfected yet. Here is another power that science has put into the hands of naval men in addition to those she had already put there. The auto-torpedo, launched in security from below the waterline of the battleship, or from a destroyer or submarine, can be directed in a straight line over a distance, and with a speed, that are constantly increasing with the improvement of the weapon. At the present moment, a speed of 27 knots over 4000 yards can be depended on, with a probability that on striking an enemy's ship below the waterline it will disable that ship, if not sink her. There seems no doubt that, in a very few years, the systematic experiments now being applied to the development of the torpedo will result in a weapon which can hardly be called inferior to the 12-inch gun, and will probably surpass it.

Controllability.—If one watches a fleet of ships moving on the sea, he gets an impression of tremendous power. But if he watches Niagara, or a thunder storm, he also gets an impression of tremendous power. But the tremendous power of Niagara, or the thunder storm, is a power that belongs to Niagara or the thunder storm, and not to man. Man cannot control the power of Niagara or the thunder storm; but he can control the power of a fleet.

Speaking then from the standpoint of the human being, one may say that the fleet has the element of controllability, while Niagara and the thunder storm have not. One man can make the fleet go faster or slower or stop; he can increase its power of motion or decrease it at his will; he can reduce it to zero. He cannot do so with the forces of nature.

Directability.—Not only can one man control the power of the fleet, he can also direct it; that is, can turn it to the right or the left as much as he wishes. But one man cannot change the direction of motion of Niagara or the lightning bolt.

Power, Controllability and Directability.—We may say then that a fleet combines the three elements of mechanical power, controllability, and directability.

The Unit of Military Power.—This is an enormous power that has come into the hands of the naval nations; but it has come so newly that we do not appreciate it yet. One reason why we do not and cannot appreciate it correctly is that no units have been established by which to measure it.

To supply this deficiency, the writer begs leave to point out that, since the military power of every nation has until recently been its army, of which the unit has been the soldier, whose power has rested wholly in his musket, the musket has actually been the unit of military power. In all history, the statement of the number of men in each army has been put forward by historians as giving the most accurate idea of their fighting value; and in modern times, nearly all of these men have been armed with muskets only.

It has been said already in this paper that the main reason why the invention of gunpowder was so important was that it put into the hands of man a tremendous mechanical power compressed into a very small space, which man could use or not use at his will. This idea may be expressed by saying that gunpowder combines power and great controllability. But it was soon discovered that this gunpowder, put into a tube with a bullet in front of it, could discharge that bullet in any given direction. A musket was the result, and it combined the three requisites of a weapon, mechanical power, controllability and directability.

While the loaded gun is perhaps the clearest example of the combination of the three factors we are speaking of, the moving ship supplies the next best example. It has very much greater mechanical power; and in proportion to its mass, almost as much controllability and directability.

The control and direction of a moving ship is a very wonderful thing; but the very ease with which they are performed makes us overlook the magnitude of the achievement and the perfection of the means employed. It may seem absurd to speak of one man controlling and directing a great ship, but that is pretty nearly what happens sometimes; for sometimes the man at the wheel is the only man on board doing anything at all; and he is absolutely directing the entire ship. At such times (doubtless they are rare and short) the man at the wheel on board, say the *Mauretania*, is directing unassisted by any human being, a mass of 45,000 tons, which is going through the water

a speed of 26.5 knots or 30 miles an hour, nearly as fast as the erage passenger train. In fact, it would be very easy to arrange board the *Mauretania* that this should actually happen; that erybody should take a rest for a few minutes, coal passers, ater tenders, oilers, engineers and the people on deck. And hile such an act might have no particular value, *per se*, and rove nothing important, yet, nevertheless a brief reflection on the ossibility may be interesting, and lead us to see clearly into the ssential nature of what is here called "directability." The man at e wheel on board the *Mauretania*, so long as the fires burn and e oil continues to lubricate the engines, has a power in his hands at is almost inconceivable. The ship that he is handling weighs s much as the standing army of Germany.

Now can anybody imagine the entire standing army of Ger-any being carried along at thirty miles an hour and turned lmost instantly to the right or left by one man? The standing rmy of Germany is supposed to be the most directable organi-ation in the world; but could the emperor of Germany move that rmy at a speed of thirty miles an hour and turn it as a whole not its separate units) through ninety degrees in three minutes?

The *Mauretania*, being a merchant ship and not fully repre-nting naval power, perhaps it might be better to take, say the *rkansas*. The weight would be more than half that of the *Mauretania*, that is it would be more than the weight of the ritish standing army; and the usual speed would be about, say, 5 knots. But in addition to all the power of the ship, as a ship, he will have the power of all the guns, twelve 12-inch guns, and wenty-one 5-inch guns, whose projectiles, not including the tor-pedoes, will have an energy at the muzzle greater than the nergy of all the muskets in the German standing army. Now nyone who has seen a battleship at battle practice knows that ll the various tremendous forces are under excellent direction nd control. And while it cannot be strictly said that they are bsolutely under the direction and control of the captain, while it ust be admitted that no one man can really direct so many apidly moving things, yet it is certainly well within the truth to ay that the ship and all it contains are very much more under he control of her captain than the German standing army is under he control of the Kaiser. The captain, acting through the helms-an, chief engineer, ordnance officer and executive officer, can

get very excellent information as to what is going on, and can have his orders carried out with very little delay; but the mere space occupied by an army of 600,000 men, and the unavoidable dispersion of its units prevent any such exact control.

In other words the captain of the *Arkansas* will wield a weapon more intrinsically powerful than the German standing army: and his control of it will be more absolute than is the Kaiser's control of that army.

Mechanism vs. Men.—Now what is the essential reason for the efficient direction exercised by the helmsman of the *Arkansas* and the relative impotency of generals? It is not that the helmsman acts through the medium of mechanism, while the generals act through the medium of men? A ship is not only made of rigid metal, but all her parts are fastened together with the utmost rigidity: while the parts of an army are men, who are held together by no means whatever except that which discipline gives, and the men themselves are far from rigid. In the nature of things it is impossible that an army should be directed as perfectly as a ship. The rudder of a ship is a mechanical appliance that can be depended upon to control the direction of the ship absolutely, while an army has no such a thing as a rudder, or anything to take its place. Again, the rudder is only a few hundred feet from the helmsman, and the communication between them, including the steering engine itself, is a strong reliable mechanism, that has no counterpart in the army.

The control of the main engines of a ship is almost as absolute as the control of the rudder; and the main engines are not only much more powerful than the legs of soldiers, but they act together in much greater harmony.

Inherent Power of a Battleship.—Possibly the declaration may be accepted now that a battleship of 26,000 tons such as the navies are building now, with, say, twelve 12-inch guns is a greater example of power, under the absolute direction and control than anything else existing; and that the main reason is the concentration of a tremendous amount of mechanical energy in a very small space, all made available by certain properties of water. Nothing like a ship can be made to run on shore; but if an automobile could be constructed, carrying twelve 12-inch guns, twenty-one 5-inch guns and four torpedo tubes, of the size of the *Arkansas*, and with her armor, able to run over the land in any

ection at 20 knots, propelled by engines of twenty thousand rse power, it could whip an army of a million men just as ckly as it could get hold of its component parts. Such a machine ld start at one end of an army and go through to the other e a mowing machine through a field of wheat; and knock down the buildings in New York afterwards, smash all the cars, ak down all the bridges and sink all the shipping.

nherent Power of a Fleet.—An idea of the power exertable by leet of modern ships may be derived from the following comrison.

When Sherman made his wonderful march to the sea from anta to Savannah, he made a march whose details are historily known, which was unopposed, which was over a flat country, good weather, and without the aid of railroad trains. It was a rch, pure and simple; and inasmuch as men are the same w as they were then, it gives excellent data of the way in which rely military or army power can move from one place to aner, *while still preserving its character and exercising its ctions.* Similarly, when Admiral Schroeder, in November, o, went from the east coast of the United States to the glish Channel, his march was unopposed, its details are known, l it gave an excellent illustration of how naval power can ve from one place to another, *while still preserving its character l exercising its functions.*

Now General Sherman was a man of world-wide fame, and so re some of his generals, and Sherman's fame will last for cenies. Compared with Sherman, Admiral Schroeder was obre; and compared with Sherman's officers, Admiral Schroeder's re obscure. Sherman's soldiers, privates and all, were made rious for the rest of their lives by having been in Sherman's rch to the sea, while Admiral Schroeder's sailors achieved no ory at all. So, the next paragraph is not intended to detract the slightest from Sherman and his army, but simply to point t the change in conditions that mechanical progress has brought out.

The statement of comparison is simply that when General herman marched from Atlanta to the sea, his army composed ,000 men, and it took him twenty-five days to go about 230 nd miles or 200 sea miles; and when Admiral Schroeder went om our coast to Europe he had sixteen ships, and he made the

trip of more than 3000 sea miles in less than fourteen days. Disregarding twenty-eight 5-inch guns, 252 3-inch guns, and a lot of smaller guns, and disregarding all the torpedoes, Admiral Schroeder took eighty-four 12-inch guns, ninety-six 8-inch guns, eighty-eight 7-inch guns and forty-eight 6-inch guns, *all mounted and available;* which, assuming the power of the modern musket as a unit, equalled more than five million modern muskets.

Such an enormous transfer of absolute, definite, available power would be impossible on land, simply because no means has been devised to accomplish it. Such a transfer on land would be the transfer of ninety times as many soldiers as Sherman had (even supposing they had modern muskets) over fifteen times the distance and at thirty times the speed; and as the work done in going from one place to another varies practically as the square of the speed, a transfer on land equivalent in magnitude and speed to Schroeder's would be a performance $90 \times 15 \times 30^2 = 1{,}215{,}000$ times as great as Sherman's.

This may seeem absurd, and perhaps it is; but why? The comparison is not between the qualities of the men or between the results achieved. Great results often are brought about by very small forces, as when some state of equilibrium is disturbed, and vice versa. The comparison attempted is simply between the *power* of a certain army and the *power* of a certain fleet. And while it is true that, for some purposes, such as overcoming small resistance, great power may not be as efficacious as feeble power, or even gentleness, yet, nevertheless, it must be clear that, for the overcoming of *great* resistance quickly great power must be applied.

The existence of a certain power is quite independent of the desirability of using it. The existence of the power is all the writer wishes to insist upon at present; the question of its employment will be considered later.

Not only is the power of a fleet immeasurably greater than that of an army, but it must always be so, from the very nature of things. The speed of an army, *while exercising the functions of an army*, and the power of a musket, while exercising its functions as a weapon of one soldier, cannot change much from what they were when Sherman went marching through Georgia. But, thanks to mechanical science, there is no limit in sight to the power to which a fleet may attain.

The power of a navy is of recent growth, but it is increasing and is going to continue to increase. Every advance of civilization will advance the navy. Every new discovery and invention will directly or indirectly serve it. The navy will become the repository of the profoundest thought and the sharpest intellectual endeavor of the age. The navy, more than any other thing, will give opportunity for mechanism, and to mechanism. Far beyond any possible imagination of today, it will become the highest expression of the Genius of Mechanism, and the embodiment of its spirit.

THE NECESSITY FOR NAVAL POWER.

The amount of money now being spent by the United States on its navy is so great that the expenditure can be justified only on the basis that great naval power is essential to the country.

Is it essential and if so, why?

Primary Use for a Navy.—To answer this wisely, it may be well to remind ourselves that the principal object of all the vocations of men is directly or indirectly the acquiring of money. Money, of course, is not wealth; but it is a thing which can be so easily exchanged for wealth, that it is the thing which most people work for. Of course, at bottom, the most important work is the getting of food out of the ground; but inasmuch as people like to congregate together in cities, the things taken out of the ground in one place must be transported to other places; and inasmuch as every person wants every kind of thing that he can get, a tremendous system of interchange, through the medium of money, has been brought about, which is called "trade." For the protection of property and life, and in order that trade may exist at all, an enormous amount of human machinery is employed which we call "government." This government is based on innumerable laws, but these laws would be of no avail unless they were carried out; and every nation in the world has found that employment of a great deal of force is necessary, in order that they shall be carried out. This force is mainly exercised by the police of the cities; but many instances have occurred in the history of every country where the authority of the police has had to be supported by the army of the national government. There is no nation in the world, and there never has been one, in which the necessary laws for the protection of the lives, property and

trade of the people that has not depended ultimately on the army; and the reason why the army could support the laws was simply the fact that the army had the power to inflict suffering and death.

As long as a country carried on trade within its own borders exclusively, as long as it lived within itself, so long as its people did not go to countries oversea, a navy was not necessary; and to countries like Switzerland it is not necessary now. But when a country is not contented to live within its own borders, then a navy becomes essential, for the same reason that an army does.

Now the desire of the people of a country to extend their trade beyond the seas seems in some ways not always a conscious desire, not a deliberate intent, but to be an effort of self protection, or largely an effort of expansion; for getting room or employment. As the people of a country become civilized, labor-saving devices multiply; and where one man by means of a machine can do the work of a hundred, ninety-nine men may be thrown out of employment; out of a hundred men who till the soil, only one man may be selected and ninety-nine men have to seek other employment. Where shall it be gotten? Evidently it must be gotten in some employment which may be called "artificial," such as working in a shop of some kind, or doing some manufacturing work. But so long as a people live unto themselves only, each nation can practically make all the machinery needed within its borders, and still not employ all the idle hands; and when the population becomes dense, employment must be sought in making goods to sell beyond the sea. The return comes back, sometimes in money, sometimes in the products of the soil, and the mine, and the manufactures of foreign lands.

In this way every nation becomes like a great business firm. It exports (that is, sells,) certain things, and it imports (that is, buys,) certain things; and if it sells more than it buys it is making money; if it buys more than it sells it is spending money. This is usually expressed by saying that the "balance of trade" is in its favor or against.

In a country like the United States, or any other great nation, the amount of exporting and importing, of buying and selling almost every conceivable article under the sun, is carried on in the millions and millions of dollars; and so perfect has the organization for doing this business become in every great country, that the products of the most distant countries can be bought in

st every village; and any important event in any country uces a perceptible effect wherever the mail and telegraph go. ie organization for effecting this in every country is so excel- and so wonderful, that it is like a machine.

fact, it is a machine, and with all the faults of a machine. one of the faults of a machine, a fault which increases nportance with the complexity of the machine, is the enormous irbance which may be produced by a cause seemingly trivial. t such is the case with the machine which the commerce of y great nation comprises, every-day experience confirms. So as the steamers come and go with scheduled regularity, so will the money come in at the proper intervals, and be dis- ited through the various channels; so long will the people live lives to which they are habituated; so long will order reign. ut suppose the coming and going of all the steamers was sud- ly stopped. While it may be true that, in a country like the ted States, no foreign trade is really necessary; while it may rue that the people of the United States would be just as py, though not so rich, if they had no foreign trade,—yet sudden stoppage of foreign trade would not bring about ondition such as would have existed if we had never had foreign trade, but would bring about a chaotic condition ch cannot fitly be described by a feebler word than "horrible." whole machinery of every-day life would be disabled. Hun- ds of thousands of people would be thrown out of employ- it, and the whole momentum of the rapidly moving enor- is mass of American daily life would receive a violent ck which would strain to its elastic limit every part of the ire machine.

t would take a large book to describe what would ensue from sudden stoppage of the trade of the United States, or of any ge manufacturing nation, with countries over the sea. Such ook would besides be largely imaginative; because in the his- y of the world such a condition has never yet arisen. Although rs have happened in the past in which there has been a blockade the coast more or less complete, peace has been declared before suffering produced has become very acute; and furthermore conditions of furious trade which now exist in certain intries have never existed before anywhere. Nations have ver become so thoroughly habituated to, and dependent upon,

foreign trade as now; so that there are no data upon which to base any actual statement of what would actually happen if our foreign trade were suddenly stopped by a blockade of our principal ports. Disasters would ensue, apart from the actual loss of money, due simply to the sudden change. In a railroad train standing still, or moving at a uniform speed the passengers are comfortable; but if that same train is suddenly brought to rest when going at a high speed, say by collision, the consequences are horrible in the extreme, and the horror is caused *simply by the suddenness of the change*. The same is true all through nature and human nature. Any sudden change in the velocity of any mass has its exact counterpart in any sudden change in the conditions of living of any man or woman, or any sudden change in the conditions under which any organization must carry on its business. The difficulty is not with individuals only, or with the organizations themselves, and does not rest solely on the personal inability of people to accommodate themselves to the losing of certain conveniences or luxeries; but it is a difficulty, possessing the nature of inertia, of instantly meeting new situations and grappling with new problems.

Every organization, no matter how small, is conducted according to some system, and that system is based upon certain more or less permanent conditions, which, if suddenly changed, make the system inapplicable. The larger the organization, and the more complex it is, the more will it be deranged by any change of external conditions, and the longer time will it take to adapt itself to them.

The sudden stoppage of our sea trade including our coasting trade by even a partial blockade of our ports, would change practically all the conditions under which we live. There is hardly a single organization in the country which would not be affected by it. And, as every organization would know that every other organization would be affected, but to a degree which could not possibly be determined, because there would be no precedent, it cannot be an exaggeration to declare that the blockading of our principal ports would, entirely apart from direct loss of money and other commodities, produce a state of confusion, out of which order could not possibly be evolved except by the raising of the blockade.

In addition to the confusion brought about, there would, of

urse, be the direct loss of money and non-receipt of imported ings; but what would probably be the very worst thing of all ould be the numbers of men thrown out of employment by the ss of foreign markets. *So long as a country can keep its people employment, so long the people will live in comparative order.* ut when there are many unemployed men in a country, not only their families lose the means of subsistence, but the very fact the men being unemployed leads them into mischief. Should e ports of any great commercial nation be suddenly closed, the eatest danger to the country would not be from the enemy tside, but from the unemployed people inside!

It will be seen, therefore, that the blockading of the principal rts of any commercial country would be a disaster so great that ere could not be a greater one except actual invasion. Another saster might be the total destruction of its fleet by the enemy's eet; but the only *direct* result of this would be that the people the country would have fewer ships to support and fewer men pay. The loss of the fleet and the men would not *per se*, be any s whatever to the country, but rather a gain. The loss of the et, however, would make it possible for the enemy's fleet to ckade our ports later, and thus bring about the horrors of which e have spoken.

While it is true that an absolute blockade of any port might be actically impossible at the present day, while it is true that submarines and torpedo boats might compel blockading ships to keep such distance from ports that many loopholes of escape would e open to blockade runners, yet it may be pointed out that even partial blockade, even a blockade that made it risky for vessels try to break it, would have a very deleterious effect upon the osperity of the country and of every man, woman and child ithin it. A blockade like this was that maintained during the eater part of the Civil War by the northern states against the uthern states. This blockade, while not perfect, while it was ch as to permit many vessels to pass both ways, was nevertheless effective that it made it impossible for the southern states to e prosperous, or to have any reasonable hope of ever being prosperous. And while it would be an exaggeration to state that he navy itself, unaided by the army, could have brought the South to terms; while it would be an exaggeration to state that all the land battles fought in the Civil War were unnecessary, that

ımerce would seem to be smothered almost like a man de-
red of outside air.

ʟ rough idea of the possible effect of a blockade of our coast
y be gathered from the fact that our exports last year were
ued at about 1,800,000,000; which means that goods to this
ount were sold for which a return was received, either in
ney or its equivalent, most of it, ultimately, as wages for
or. Of course no blockade could stop all of this; but it does
seem impossible that it could stop half of it, if our fleet were
troyed by the enemy. Supposing that this loss were divided
ıally among all the people in the United States, it would mean
t each man, woman and child would lose about ten dollars in
year. If the loss could be so divided up, perhaps no very
at calamity would ensue. But, of course, no such division
ıld be made; with the result that a great many people, especially
r people, earning wages by the day, would lose more than
y could stand. Suppose, for instance, that a number of people
ning about nine hundred dollars a year, by employment in
ort enterprises, were the people upon whom the actual loss
tually fell by their being thrown out of employment. This
d mean that more than a million people, men, women and
dren, would be actually deprived of the means of living. It
ms clear that such a thing would be a national disaster, for any
s of money to one man always means a loss of money or its
ivalent to other men besides. For instance: suppose A owes $20
B, B owes $20 to C, C owes $20 to D, D owes $20 to E, E owes
to F, F owes $20 to G, G owes $20 to H, H owes $20 to I, and
o J. If A is able to pay B and does so, then B pays C and
on, and everybody is happy. But suppose that A for some
son, say a blockade, fails to receive some money that he
pected; then A cannot pay B, B cannot pay C, and so on; with
result, that not only does J lose his $20, but nine men are
t in debt $20 which they cannot pay; with the further result
t A is dunned by B, B is dunned by C and so on; pro-
cing a condition of distress, which would seem to be out
all proportion to a mere lack of $20, but which would, never-
less, be the actual result. So in this country of 90,000,000
ple, the sudden loss of 900,000,000 dollars a year would pro-
e a distress seemingly out of all proportion to that sum of
ney, because the individual loss of every loser would be felt
everybody else.

Since to a great manufacturing nation, like ours, the grea
nger from outside (except actual invasion) would seem to
e sudden stoppage of her over-sea trade by blockade, we se
arranted in concluding that, since *the only possible means*
eventing a blockade is a navy, the primary use for a navy i
event blockade.

This does not mean that a fleet's place is on its own coast,
use a blockade might be better prevented by having the f
sewhere; in fact it is quite certain that its place is not on
ast as a rule, but at whatever point is the best with relatio
e enemy's fleet, until the enemy's fleet is destroyed. In
nce the defensive and the offensive are so inseparably conne
at it is hard sometimes to tell where one begins and the o
nds, the best position for our fleet might be on the ene
oast. It may be objected that the coast of the United State
long that it would be impossible to blockade it.—Perhaps,
at is not necessary: it would suffice to blockade Boston, N
ort, New York, the Delaware, the Chesapeake and the Gu
ly with forty ships. And we must remember that blockade
ng would be much more difficult now than in the Civil W
ecause of the increased power and accuracy of modern gun
nd the advent of the searchlight, wireless telegraph and a
lane.

It may also be objected that the blockading of even a
enseless coast would cost the blockading country a good de
oney, by reason of the loss of trade with that country. T
ut war is always expensive; and the blockade would be
uch more expensive to the blockaded country; and thoug
ight hold out a long while, it would be compelled to yiel
ne end; not only because of the blockade itself, but becaus
he pressure of neutral countries: and the longer it held out,
reater the indemnity it would have to pay. The expense
lockading would therefore be merely a profitable investment.

The writer is aware that actual invasion of a country fr
he sea would be a greater disaster than blockade, and that
ense against invasion has often been urged in Great Britain
reason for a great navy; so that the primary reason for a n
night be said to be defense against invasion. But why sho
n enemy take the trouble to invade? Blockade is eas
and cheaper, and can accomplish everything that an enemy d
sires, unless there are enough battleships to prevent it.

Command of the Sea.—While the *primary* use of a navy ems to be to prevent blockade, a navy, like any other weapon, y be put to any other uses which circumstances indicate. For tance, the northerners in the Civil War used the navy not to event blockade, but to make blockade; the Japanese used the vy to cover the transportation of their armies to Manchuria and rea; and Great Britain has always used her navy to protect her de routes.

A general statement of the various uses of a navy has been put o the phrase "command of the sea."

Probability of War.—Inasmuch as an adequate navy can prevent ckade, besides serving other uses, and inasmuch as our annual penditure on the navy is only about 8 per cent of the value of r exports, it would seem logical to conclude that such expendie is advisable, unless it is a larger percent than is paid for inrance of other kinds, and with a smaller risk.

Of course, the percent is smaller; but what is the degree of k? What is the degree of probability of war with a country le to blockade us?

This degree of probability cannot be determined as accurately the probabilities of fire, death, or other things against which urance companies insure us; and one reason is that insurance mpanies do not really insure against fire, for instance, but only ainst loss by fire, whereas a navy does insure against war. r this reason, the probability of fire can be figured out to be definite fraction; but the probability of war between two given ntries cannot be so figured out, because it is a variable antity. As between two countries of equal wealth, the probabil- of war varies with the disparity between their navies, and is ctically zero, when their navies are equal in power; and, other tors being equal, the *greatest probability of war is between o countries, of which one is the more wealthy and the other more powerful.*

In reckoning the probability of war, we must realize that *the st pregnant causes of war is the combination of conflicting erests with disparity in power.* And we must also realize t it is not enough to consider the situation as it is now: that it necessary to look at least ten years ahead, because it would e the United States that length of time to prepare a navy powul enough to fight our possible foes with reasonable assurance uccess.

ars, however, is not really far enough ahead to look, f
ple reason that, while we could get a few ships ready
years, we could not get many ready. If, for instance, so
ange in policies or in interests should make war with Gre
itain probably within ten years, we could not possibly bui
ough ships to prevent our being beaten, and blockaded, a
rced to pay an enormous indemnity.

Is there *no* probability of this? Perhaps there is no gre
obability; but there certainly is a possibility. In fact, it migh
a very wise act for Great Britain, seeing us gradually su
ssing her, to go to war with us before it is too late, and cr
It has often been said that Great Britain could not afford
to war with us, because so many of her commercial intere
ould suffer. Of course, they would suffer for a while; but
the commercial interests of competing railroads when th
gin to cut rates. Cutting rates is war—commercial war: b
is often carried on, nevertheless, and at tremendous cost.

Of course, just now, Great Britain does not wish to crush u
t it is certain that she can. It is certain that the richest count
the world lies defenseless against the most powerful; and th
could not alter this condition in ten years, even if we start
build an adequate navy now.

Yet even if the degree of probability of war with Great Brit
thin say ten years, seems so small that we need not consi
r, are there no other great powers with whom the deg
probability of war is great enough to make it wise for us
nsider them?

Before answering this question, let us realize clearly that o
the strongest reasons that leads a country to abstain fro
r, even to seek relief from wrongs, actual or imagined, is
ubt of success; and that that reason disappears if anoth
untry, sufficiently powerful to assure success, is ready to he
r, either by joining openly with her, or by seeking war her
f at the same time with the same country. As we all know
ses like this have happened in the past. Great Britai
ows it; and the main secret of her wealth is that she has alway
en strong enough to fight any two countries.

It is plain that a coalition of two countries against us is pos
le now. The United States is regarded with feelings of ex-

reme irritation by the two most warlike nations in the world, ne on our eastern side and the other on the western. War with ither one at the present moment would call for all the energies f the country, and the issue would be doubtful. But if either ountry should consider itself compelled to declare war, the other ould not possibly be so blind to her opportunity as not to declare var simultaneously. The result would be exactly the same as if ve fought Great Britain, except that our Pacific Coast would be lockaded besides the Atlantic, and we should have to pay in-lemnity to two countries instead of to one country.

A coalition between these two countries would be an ideal ar-angement, because it would enable each country to force us to grant the conditions it desires, and secure a large indemnity besides.

Would Great Britain interfere in our behalf? This can be answered by the man so wise that he knows what the international situation and the commercial situation will be ten years hence. Let him speak.

EXPENDITURES.

Clearly, expenditures for a navy are not expenditures in the orrect sense of the word. An "expenditure" is something which one person pays out to somebody else; but the money spent on our navy is not paid out to somebody else but to ourselves. Further-more, not only is the money given to ourselves, but it provides employment. What civilized man in civilized communities needs more than any other thing, is employment and the wage therefor: so that whatever gives good employment and good wage is a national blessing of the highest order.

But not only does the yearly expenditure on our navy give good mployment and good wages, directly and indirectly, to thousands of men; it also gives scope for the use of capital, and opportunity or the development and improvement of the most perfect grades of manufactured articles; opportunity for invention of the highest kind.

Therefore, it must be accepted as a fact, that in addition to the ecurity assured, the existence of a navy properly proportioned o our wealth and foreign trade, and to the probability of war, does not impose a burden, but rather bestows a blessing.

WILL THE IMPORTANCE OF NAVAL POWER INCREASE OR DECREASE?

It is clear that the importance to a country of a navy vari with two things—the value of that country's foreign trade an the probability of war.

It is also clear that, other things being equal, the probabilit of a country becoming involved in war varies as the value of he foreign trade; because the causes of friction and the money a stake vary in that proportion.

Therefore, *the importance to a country of her navy varies a the square of the value of her foreign trade.*

In order to answer the question, therefore, we must first con sider whether foreign trade—sea trade—is going to increase o decrease.

As to the United States alone, the value of our exports is abo ten times what it was fifty years ago, and it promises to increase But the United States is only one country, and perhaps her in crease in foreign trade has been due to conditions past or passing So—what is the outlook for the future—both for the Unite States and other countries? Will other countries seek foreig trade?

Yes. The recent commercial progress of Germany, Argentina and Japan, shows the growing recognition by civilized and enter prising countries of the benefits of foreign trade, and of the facili ties for attaining it which are now given by the advent of larg swift, modern steamers: steamers which are becoming large and swifter and safer every year, more and more adapted fo ocean trade. For not only have the writings of Mahan brough about an increase in the sea power of every great country; but this increase has so aroused the attention of the engineering pro fessions, that the improvement of ships, engines, and other sea material has gone ahead faster than all the other engineering arts.

The reason why the engineering arts that are connected with the sea have gone ahead more rapidly than any other arts is simply that they are given wider opportunity and a greater scope. It is inherent in the very nature of things that it is easier to trans port things by water than by land; that water transportation lends itself in a higher degree to the exercise of engineering skill, to the attainment of great results.

The underlying reason for this difference seems to be that it is not possible to make any vehicle to travel on land appreciably larger than the present automobile, unless it run on rails; whereas the floating power of water is such that vehicles can be made, and are made, as large as forty-five thousand tons. Two ships, the *Mauretania* and *Lusitania* of forty-five thousand tons displacement, have been running for three years, larger vessels are building, and undoubtedly will be run: for the larger the ships, the less they cost per ton of carrying power, the faster they go, and the safer they are.

Sea commerce thus gives to engineers, scientists and inventors, as well as to commercial men, that great gift of the gods—opportunity.

The number of ships that now traverse the ocean and the larger bodies of water communicating with it aggregate millions of tons, and their number and individual tonnage are constantly increasing. These vessels cruise among all the important sea ports of the world, and form a system of intercommunication almost as complete as the system of railroads in the United States. They bring distant ports of the world very close together, and make possible that ready interchange of material products, and that facility of personal intercourse which it is one of the aims of civilization to bring about. From a commercial point of view, London is nearer to New York than San Francisco, and more intimately allied with her.

The evident result of all this is to make the people of the world one large community, in which, though many nationalities are numbered, many tongues are spoken, many degrees of civilization and wealth are found, yet, of all, the main instincts are the same: the same passions, the same appetites, the same desire for personal advantage.

Not only does this admirable system of intercommunication bring all parts of the world very closely together, but it tends to produce in all a certain similarity in those characteristics and habits of thought that pertain to the material things of life. We are all imitative, and therefore we tend to imitate each other; but the inferior is more apt to imitate the superior than vice versa. Particularly are we prone to imitate those actions and qualities by which others have attained material success. So it is to be expected, it is already a fact, that the methods whereby a few

great nations attained success are already being imitated by other nations. Japan has imitated so well that in some ways she has already surpassed her models.

With such an example before her, should we be surprised that China has also become inoculated with the virus of commercial and political ambitions? It cannot be many years before she will be in the running with the rest of us, with four hundred millions of people to do the work; people of intelligence, patience, endurance and docility; people with everything to gain and nothing to lose; with the secret of how to succeed already taught by other nations, which she can learn from an open book.

If Japan has learned our secret and mastered it in fifty years, will China not be able to do it in less than fifty years.

Before we answer this question, let us realize clearly that China is much nearer to us in civilization than Japan was fifty years ago; that China has Japan's example to guide her, and also that any degree of civilization which was acquired by us in say one hundred years will not require half that time for another nation merely to learn. The same is true of all branches of knowledge; the knowledge of the Laws of Nature which it took Sir Isaac Newton many years to acquire may now be mastered by any college student in two months. And let us not forget, besides, that almost the only difficult element of civilization which other people need to acquire, in order to enter into that world-wide competition which is characteristic of the time we live in, is "engineering" broadly considered. Doubtless there are other things to learn besides; but it is not apparent that any other things have contributed largely to the so-called new civilization of Japan. Perhaps Japan had advanced enough in Christianity to account for her advance in material power, but if so she keeps very quiet about it. It may be, also, that the relations of the government to the governed people of Japan are on a higher plane than they used to be, but on a plane not yet so high as in our own country; but has anyone ever seen this claimed or even stated? It may be that the people of Japan are more kindly, brave, courteous and patriotic than they were, and that their improvement has been due to their imitating us in these matters; but this is not the belief of many who have been in Japan. One thing, however, is absolutely sure; and that is that Japan's advance has been *simultaneous* with her acquirement of the engineering arts, espe-

cially as applied to military and naval matters and the merchant marine.

But even supposing that China does not take part in the world-wide race for wealth, we cannot shut our eyes to the fact that Great Britain, Germany, France, Italy, Japan, Argentina and the United States; besides others like Sweden, Norway, Belgium, Holland, Spain and Portugal, are in the race already; and that several in South America bid fair to enter soon. Not only do we see many contestants, whose numbers and ardor are increasing, but we see, also, the cause of this increasing. The cause is not only a clearer appreciation of the benefits to be derived from commerce across the water under conditions that exist now; it is also a growing appreciation of the possibilities of commerce under conditions that will exist later; with the countries whose resources are almost entirely undeveloped. For four hundred years, we of the United States, have been developing the land within our borders, and the task has been enormous. At one time it promised to be the work of centuries; and with the mechanical appliances of even one hundred years ago, it would have taken a thousand years to do what we have already done. Mechanical appliances of all kinds, especially of transportation and agriculture, have made possible what would, otherwise, have been impossible; and mechanical appliances will do the same things in Tierra del Fuego and Zululand.

Mechanism, working on land and sea, is opening up the resources of the world. And now, another allied art, that of chemistry, more especially biology, is in process of removing one of the remaining obstacles to full development, by making active life possible, and even pleasant, in the tropics. It is predicted by some enthusiasts that, in the near future, it will be healthier and pleasanter to live in the tropics, and even do hard work there, than in the temperate zone. When this day comes, and it may be soon the development of the riches of lands within the tropics will begin in earnest, and wealth undreamed of now be realized.

The opening of the undeveloped countries means a continuing increase of wealth to the nations that take advantage of the opportunity, and a corresponding backsliding to those nations that fail. It means over all the ocean, an increasing number of steamers. It means the continuing increase of manufacturing in manufacturing countries, and the increasing enjoyment in them

of the good things of all the world. It means in the undeveloped countries an increasing use of the conveniences and luxuries of civilization and an increasing possession of money or its equivalent. It means, throughout all the world, an increase of what we call " Wealth."

In discussing a subject so great as sea trade, while it may be considered presumptuous to look fifty years ahead, it can hardly be denied that we ought at least to try to look that far ahead. To look fifty years ahead, is, after all, not taking in a greater interval of time than fifty years back; and it certainly seems reasonable to conclude that, if a certain line of progress has been going on for fifty years in a perfectly straight line, and with a vigor which is increasing very fast and shows no sign of change, the same general line of progress will probably keep up for another fifty years. If we try to realize what this means, we shall probably fail completely and become dazed by the prospect. We cannot possibly picture accurately or even clearly to ourselves any definite conditions of fifty years hence; but we certainly are warranted in concluding that by the end of fifty years, practically all of the countries of the world, including Africa, will be open to trade from one end to the other; that the volume of trade will be at least ten times as great as it is now; that the means of communication over the water and through the air will be very much better than now; and that there will be scores of appliances, methods and processes in general use of which we have, as yet, no inkling, and cannot even imagine.

Now let us call to mind the accepted proverb that " Competition is the life of trade," and this will make us see that, accompanying this stupendous trade, extending over, and into, every corner of the world, there will be stupendous competition, involving in a vast and complicated net, every red-blooded nation of the earth.

We seem safe in concluding therefore, that the importance of naval power will increase.

THE DANGER FROM A GREAT NAVY.

The power that a navy can wield may be urged by some as a reason against creating it; on the ground that while such great power may be desired by naval officers, and desired even by the government; and while, from their standpoint, a navy should

be as powerful as possible, and as directable as a swordsman's sword,—yet, from the standpoint of the citizen, such a condition would be a danger to the country at large, because it would have all the elements of danger that a standing army has, but developed to a much higher point.

To this it may be answered that, although naval power is the greatest power we know of, yet, like some explosives, it combines tremendous power with perfect safety. Because a thing is powerful it is not necessarily dangerous; a thing is dangerous, not because it is powerful, but because it is uncontrollable. Now a navy, although it can make itself very disagreeable to the government, as Brazil's navy has recently done, can speedily be reduced to impotency by depriving it of food and fuel.

ARBITRATION, LIMITATIONS OF ARMAMENT, ETC.

A great deal is said and written nowadays about the ability of arbitration to make wars unnecessary, and a good deal also about the possibility of an agreement among the nations, whereby armaments may be limited to forces adequate to ensure that every nation shall be compelled to abide by the decision of the others in any disputed case.

In view of the number, the earnestness and the prominence of many of the men interested in this cause: in view of the number of arbitration treaties that have been already signed: in view of the fact that arbitration among nations will simply establish a law among them like the law in any civilized country: in view of the fact that individuals in their dealings with each other sometimes surrender certain of their claims, and even rights, for the common good: in view of the fact that nations, like all business firms, like to cut down expenses, and in further view of the fact that a navy is not directly, but only indirectly, a contributor to a nation's prosperity, it seems probable that arbitration will be more and more used among the nations, and that armaments may be limited by agreement. It is clear, however, that the practical difficulties in the way of making the absolute agreement required are enormous, and that the most enthusiastic advocates of the plan do not expect that the actual limitation of armaments will become a fact for many years.

After the necessary preliminaries shall have been arranged, and the conference takes place which shall settle what armament

each nation may have, it is plain that it will be to the interest of each nation to keep down the armament of every other nation, and to be allowed as much as possible itself. In this way, the operation of making the agreement will be somewhat like the forming of a trust among several companies, and the advantage will lie with that nation which is the most powerful.

For this reason it would seem a part of wisdom of each country to enter the conference with as large a navy as possible.

Therefore, the probability of an approaching agreement among the nations as to limitation of armaments, instead of being a reason for abating our exertions towards establishing a powerful navy, is really a conclusive reason for redoubling them.

HOW GREAT SHOULD OUR NAVY BE?

This may seem a question impossible to answer. Of course it is impossible to answer it in terms of ships and guns; but an approximate estimate may be reached by considering the case of a man playing poker who holds a royal straight flush. Such a man would be a fool if he did not back his hand to the limit and get all the benefit possible from it. So will the United States, if she fails to back her hand to the limit, recognizing the fact that in the grand game now going on for the stakes of the commercial supremacy of the world, she holds the best hand. She has the largest and most numerous sea ports, the most enterprising and inventive people: and the most wealth with which to force to success all the various necessary undertakings.

This does not mean that the United States ought, as a matter either of ethics or of policy, to build a great navy in order to take unjust advantage of weaker nations; but it does mean that she ought to build a navy great enough to save her from being shorn of her wealth and glory by simple force, as France was shorn in 1871.

It is often said that the reason for Great Britain's having so powerful a navy is that she is so situated geographically that, without a powerful navy, to protect her trade, the people would starve.

While this statement may be true, the inference usually drawn is fallacious: the inference that if Great Britain were not so situated, she would not have so great a navy.

Why would she not? It is certain that that "tight little island" has attained a world-wide power, and a wealth per capita greater than those of any other country; that her power and wealth, as compared with her home area, are so much greater than those of any other country as to stagger the understanding; that she could not have done what she has done without her navy; that she has never hesitated to use her navy to assist her trade, and yet that she has never used her navy to keep her people from starving.

In fact, the insistance on the anti-starvation theory is absurd. Has any country ever fought until the people as a mass were starving? Has starving any thing to do with the matter? Does not a nation give up fighting just as soon as it sees that further fighting would do more harm than good? A general or an admiral, in charge of a detached force, must fight sometimes even at tremendous loss and after all hope of local success has fled, in order to hold a position, the long holding of which is essential to the success of the whole strategic plan: but what country keeps up a war until its people are about to starve? Did Spain do so in our last war? Did Russia fear that Japan would force the people of her vast territory into starvation?

No—starvation has nothing to do with the case. If some discovery were made by which Great Britain could grow enough to support all her people, she would keep her great navy nevertheless—simply because she has found it to be a good investment.

The anti-starvation theory—the theory that one does things simply to keep from starving—does apply to some tropical savages, but not to the Anglo-Saxon. Long after starvation has been provided against, long after wealth has been secured, we still toil on. What are we toiling for? The same thing that Great Britain maintains her navy for—wealth and power.

The real reason for Great Britain's having a great navy applies with exact equality to the United States. Now that Great Britain has proved how great a navy is best for her, we can see at once how great a navy is best for us. That is—since Great Britain and the United States are the wealthiest countries in the world, and since the probability of war between any two countries is least when their navies are equal in power,—the maximum good would be attained by making the United States Navy exactly equal to the British Navy.

EFFICIENCY.

Inasmuch as the naval power represented by any fleet depends on its efficiency as well as on its numerical strength; and inasmuch as our fleet will be required, within not many years, to fight the fleet of some foreign power, or powers, in a war greater than any that has ever yet occurred, to decide whether the progress of the United States shall continue or shall cease, we, naval officers, see before us the necessity of shouldering responsibilities more racking and far-reaching than can ever come to men in any other calling.

It may be interesting, therefore, to consider, broadly, in what general directions we should work, to make our navy as efficient as possible; not including any great questions of strategy, drill or tactics, which are sciences in themselves, and which must be adapted to changing conditions year by year, but merely some simple principles, which, if rightly apprehended and correctly stated, will be permanent guides for thought and action.

The subject may be considered in its two main divisions, material and personnel.

MATERIAL.

While it is plain that the material is dominated by the personnel, and is therefore subordinate to it, and while the difference between them seems clear in all our minds, yet nevertheless it would be difficult to define that difference, and to state its intrinsic features.

The difficulty appears as soon as a little reflection leads us to see that people, as well as machines, are composed of matter, controlled by mind and spirit. We can all see this, even if we neglect any consideration as to the ultimate constitution of matter; for we agree closely enough for the purposes of this paper as to what matter is, and know that the bones and flesh of the human body are as truly matter as are the steel and brass parts of an engine.

In fact, there is a curious likeness between man and mechanism, for both are made of inert matter, but are capable of prodigious activity when vivified. The Bible tells us that God made man out of the dust of the ground and afterwards breathed into his nostrils the breath of life: and we see a hundred times a day some combination of brass and iron parts begin to do the most wonderful things, as soon as some one opens a valve, or closes a switch.

In both man and mechanism we see ordinary matter act in obedience to laws, some of which we do not understand at all and some of which we understand in only a restricted sense. But in even those cases which we seem to understand—say the nourishing effect of food, or the energizing effect of burning coal,—we know that behind each one has been the Creative Mind.

So, may we not say that in both man and mechanism we see the direct effect of mind on matter?

Matter is often called "dead;"—but it just as much alive as bones and flesh *per se;* and a machine without steam or electricity, or other element that gives it life, is no more dead than a human body, from which the spark of life has fled.

In fact, it is very much less so; because, even if badly deranged, it can, with sufficient pains, be restored to health; and with a supply of steam or electricity, it will start again sturdily at its work; while nothing can put the spark of life into the dead body of a human being. And not only in this way but in another is machinery less lifeless than a human body; in the quality of progress. The human body does not progress; it remains the same from generation to generation; but mechanism is of such a nature that each improvement forms a stepping stone for improvements yet to come.

In two essentials of living, in strength to do, and in delicacy to perceive, mechanism surpasses anything to which man can dare to aspire. This does not mean that there are no things which man can do which mere mechanism cannot do; for such an assertion would be absurd. Mere mechanism, perhaps, has no consciousness of its own existence; cannot consciously see, smell, hear or feel; has no conscience, and cannot think (so far as we know); yet there can be no question that the photograph can produce pictures of things which the eye, unaided, cannot see; that the microphone can pick up vibrations which the ear, unaided, cannot hear; that chemical tests detect essences far more delicately than can human smell or taste; that electric contact is far more accurate than human touch. And while it may be true that mechanism cannot think, some of its operations surpass in quickness and precision the mind and nerve coordination of the human body. If we wish to find out how long it takes for the finger to press an electric button, after a certain signal has been made, we find out by electric mechanism; that is, although man assumes that the human ma-

chine is the most highly organized machine there is, we use an ordinary electrical machine to test the degree of perfection of one of the human machine's most wonderful faculties.

Mechanism cannot think: but what is thinking and what does thinking accomplish? In the lives of most people, all the thinking they do is devoted to getting them through life with the least trouble and the most enjoyment. Yet everybody knows that their thinking, even along this line, is not very efficacious; they do not even know how much to eat and drink, while automatic stokers feed the exact amount of coal required, no more and no less, and an ordinary street car pumps up its air tank automatically.

These are mechanisms invented by man, yet they do things that man himself cannot do. And some mechanisms invented by man, such as the wireless telegraph, possess an inherent delicacy compared with which the nerves of the human body are as coarse as manila hawsers.

But why multiply examples of things which mechanism can do and man cannot do,—when the objection will be made at once that mechanism does not do these things, but that man does them using mechanism as his tools?

Granting that he does, is not man merely a medium between the Almighty and the mechanism? Is he not merely an intermediate mechanism? There are many people who believe that man does not do so much as he thinks he does, and that he himself is as much a tool in the hands of Providence as a hammer is in his hands. One fact is certainly clear; and that is, that man is not the master of mechanism, for the simple reason that he can not control mechanism after he has once "created" it, or undo what he has done. After Bell had invented the telephone, he became powerless to control it. He could not uninvent it, he could not return conditions to the point from which he had moved them. Having certain forces at work, he had to sit an almost helpless spectator of the effects of which his own invention was the cause.

Returning to practical affairs, and looking back to man's first discovery of fire, and his fashioning of his first rude implements, and watching his progress to his present high estate of material well being, do we not see clearly that man himself has changed but little in all the centuries; that systems of government and philosophy have merely kept society in order, and maintained the

status quo; and that the principal means by which man has achieved his present material prosperity has been by overcoming material difficulties, by inventing and developing material mechanisms?

If this has been so in the past, will it not be so in the future? If so,—the principal means by which a man will be able to make his material condition better still will be by inventing and developing material mechanisms.

Now in what field do we find to-day the largest use of mechanism? The navy. What field gives the greatest promise to the inventor, the physicist and the engineer? The navy. What thing gives such an opportunity for the invention, development and use of mechanism, that—if wisely treated—it will become the most potent instrumentality in all the world for advancing civilization and the power of civilized nations? The navy.

Our warships have acquired a power, a vastness, and a multiplexity of functions, such that they offer an almost infinite field for the development of good ideas. The warship, more than any other thing, is a little world in itself. It must be self-sustaining, it must be self-contained, it must go to all parts of the world and be able in all parts of the world to deal the strongest blow, and withstand the strongest blow that science and art make possible. And as the people on board are subject, more than any other people, to the dangers of varying climates, of accidents, and of war; and as their guns, torpedoes, electric mechanisms of all kinds, and all their appliances, must combine the highest possible power with the highest possible delicacy, there seems no limit to their requirements in the matter of mechanism; there seems no kind of mechanism for which they may not find a use; there seems no limit to the power that they will reach.

If we agree that our material should be as efficacious as possible, we shall probably go ahead as we have been doing in the past few years, and keep up with the progress of the engineering arts. We feel perfectly safe in assuming this, for the officers and men of the navy are an exceedingly intelligent and enterprising body; and the task of keeping our material up to the times is a definite task, performable by hard work, directed by good judgment and common sense.

But there is a duty that we ought to do, that we never have done, and that we Americans can do better than any other people in the world.

This duty is to take advantage of the national inventive genius of our country and encourage—not merely engineering skill, not merely mechanical ingenuity—but real invention. Knowing the brilliant original inventive genius of our countrymen, and the dazzling opportunities of the future, we must not stop short of a determined effort to "ascend the highest Heaven of invention." We must hold as high an ideal in this matter as we do in the matters of strategy, tactics and engineering.

Such a policy, wisely and energetically carried out, will have as direct and beneficial effect on the navy as our admirable patent system has on the country at large. But, to carry it out, we must first treat inventors as sane and reputable men, and recognize the fact that not only does an attempt to evade plain patent rights seem to inventors as dishonorable, but it turns inventors to fields where they have more chance than in a battle against the Government.

Why inventors should be treated as they have been is not quite clear. Why encourage authors to publish books on naval subjects and reap not only the money but the glory;—and then deny to inventors—no matter what pecuniary sacrifices they may have made in developing their inventions—all remuneration and all glory? Certainly it has been neither wise nor right to humiliate a class of men who have been useful in the past, and can be made useful in the future.

What is gained by such a policy? A little money is saved sometimes: but is it not a little like saving money by not paying a tailor's bill?

Certainly it is not right for a great government to violate its own patent laws, and infringe patents which the government itself granted and for which it received $35 each.

Does anyone deny that the inventor is a necessity of progress? Does anyone deny that the inventor must precede the engineer—that conception must precede development? Does anyone deny that our electric lights, torpedoes, guns and engines were invented before they were developed; that they were conceived before they grew and waxed into maturity? Does anyone deny that, but for inventors, the coal and iron and brass of our ships would still be in the bowels of the earth?

We all know that ideas are what have breathed the breath of life into material brass and iron, and made cities and churches,

and pictures and books, and ships,—and every single thing that distinguishes men from brutes. *It has already been possible for one invention to increase the hitting power of naval guns at least ten times.* Why not develop such things as soon as possible in secret, and secure the military advantages accruing; instead of resisting them until all the world knows about them, and then being tremendously secret about details that any intelligent mechanic can vary in a dozen ways?

PERSONNEL.

When thinking of a naval power, one cannot help thinking of Great Britain, which has pushed naval power to a point far beyond that attained by any other nation, and far beyond the dreams of not many years ago. And one cannot help thinking, too, of France, almost in sight of England; a country of more natural wealth, with a longer coast line to guard, and formerly with a greater population; a country, which not many years ago, was equal to Great Britain in naval power, but which is now immeasureably behind her, and is becoming more so with each succeeding year.

Why is it that Great Britain has surpassed France in naval power? We are familiar with many of the answers given; the policy of the Government, the killing of many French officers during the Reign of Terror, the greater need of Great Britain for a navy, etc. But is there not another factor as great as any of these: the difference in the characters of the two peoples?

Daring.—Some years ago, in the harbor of Toulon, the writer had the opportunity on several occasions of watching the sailors of French battleships, while in swimming. He had often seen the sailors of our ships and of British ships when in swimming from their vessels; and the occasions were always those of boisterous merriment and frolic, in which many men would jump from the lower yards and the davit heads, and dive backwards from the booms; but he was amazed, at first, to see the French sailors glide very carefully down the lower booms, until they reached the water, and then drop into the water in the gentlest fashion. There was an utter absence of that rollicking, devil-may-care, risk-taking element that is so plainly to be seen when American or British sailors are in swimming.

While not accusing the French people of timidity, may not one say that this apparently unimportant difference in swimming indicated an extremely important difference in character? And is not one safe in saying that the French are much more prudent than the British? Certainly they are more prudent in money matters; and while the individual Frenchman is, because of his prudence, or thrift, as comfortably established in life as the Englishman, yet the prudence of the Frenchman makes him shrink from risking money in large enterprises; with the result that Great Britain, Germany, and the United States have far outstripped France in those great commercial enterprises, which require for their success the risking of money. And it is well known that the Frenchman's prudence has caused the lowering of the birth-rate of France to such a degree that she is already in a condition from which it will be very hard to extricate herself.

Ruggedness.—Associated with the prudence of the Frenchman, is a quality somewhat allied, and yet a little different; the shrinking from disagreeable things. We all shrink from disagreeable things, but the Frenchman seems more sensitive to disagreeable things than the Briton. He is more fastidious; he cannot "endure hardness" to an equal degree. If a British ship and a French ship are in the same harbor, we see the British officers taking long walks ashore in ugly clothes with heavy boots, perhaps in the rain and mud; a thing amazing and almost revolting to the French, who prefer to go ashore in a gentlemanly fashion, and sit down in the club and read, and smoke cigarettes.

Now supposing that this comparison of the individual Frenchman and the individual Briton is substantially correct, and supposing that we knew that there were two fleets, one manned by British and the other manned by Frenchmen,—and that we knew that one was the blockader and the other the blockaded in a port, would not any man wager at once that the British would be the blockaders and the Frenchmen the blockaded? Or suppose we knew that one of two fleets of sailing ships took the weather gauge, and forced the fighting, while the other took the lee gauge and accepted the attack; would not any man in the world know immediately that it was the British who were forcing the fighting and the Frenchmen who were awaiting it? Surely anyone would know which would take the weather gauge and which the lee gauge; and anyone would know which would be the better sailor.

While it would be incorrect to state that the Briton enjoys being hurt, he does not mind being hurt so much as does the Frenchman: he is tougher; he is more rugged; he is not so easily turned from his path by some unpleasantness; he does not mind hardship so much as does the Frenchman.

This ruggedness, with its accompaniment of fondness for outdoor life, has brought about in the Briton (or at least the two qualities co-exist) a superior physique; this meaning not necessarily greater freedom from disease, or greater longevity, but a greater physical strength, a greater ability to withstand the rigors of the elements,—a capacity for feeling comfortable when other people are most uncomfortable. This ruggedness is needed by the sailor more than by the soldier, whose hardships, while at times as great as those of the sailor, are of very much less frequency and duration.

Since a man accustomed to hardship is not so easily dismayed by an undertaking involving hardship as a man who is not accustomed to it; since a man accustomed to hardship is not so apt to lose his equanimity under unpleasant conditions; since a man's equanimity is one of his greatest assets; since a man of even temper is apt to have better judgment under trying conditions than a peevish or irritable man, the proverbial equanimity of the Briton would seem to be due in some measure to his rugged mode of life, and to account in some degree for his success in attaining naval power.

By an effort of will a man accustomed to luxury may force himself to undertake severe hardship; and a man habituated to self indulgence may be master of himself under bad conditions; but it must be true as a matter of common sense that, if two nations are otherwise equal, but one nation is composed of daring men, inured to hardship, while the other is composed of prudent men not inured to hardship, the former will be able to create the greater naval power.

As an important feature of the personnel, therefore, it would seem wise to follow St. Paul's advice, and learn to "endure hardness."

Spirit.—Yet mere ruggedness and strength, mere physical courage even, will not avail to produce great naval power, if a nation's men are not inspired with a curious essence, which is not physical or mental, but is wholly spiritual. So great is the potency of this

essence that, under its influence, men and women of the most delicate physique have risen to the loftiest heights of daring and endurance. It is this which, often carried to excess, makes the runner or the oarsman die in the race; the thing which gives the football match its character; which made the Christian martyrs what they were; which has enabled many so-called suffragettes in England to starve to death, rather than to surrender.

We all know what this quality is, though it is called by several names: "pluck," "grit," and "sand," are perhaps the names most used in English; but the word "spirit" seems to express the quality itself and also the cause behind it. It is the spirit, as distinguished from the body or the mind; it is seen in brutes, but it is spirit just the same. It enables a man, sometimes a brute, to be superior to circumstances, often to dominate them. Associated with it are will, determination, courage, endurance, etc.; but they are all inspired by spirit, the direct gift of the Almighty.

Mahan speaks of Nelson as being the "embodiment of the sea power of Great Britain." Why? Many officers have attained higher rank than Nelson; many have commanded larger fleets; many have been more impressive, more learned, and in the usual sense of the words, better officers than Nelson. But Nelson had something in him that enabled him to triumph over his poor weak body, and his various faults and deficiencies of character, and be the greatest naval officer that ever lived. That something was spirit; an impetuous and yet perfectly guided spiritual force, that carried along not only him, but everybody under him. There was no such man in the French navy, but there was such a man in the French army, whose name was Napoleon. It is doubtful if Nelson had the same intellectual power as Napoleon, but this can never be determined, because Nelson lived in a comparatively restricted field. But Napoleon was not intellect alone, he was a tremendous force. He and Nelson were alike in their little bodies and their impetuous activity, which put impetuous activity into everybody else, and made one the greatest sailor of modern times and the other the greatest soldier.

Probably this spirit is shown in a higher degree by the Japanese than by any other nation. It seems almost possible for the men of a Japanese regiment to be not individuals at all, but simply parts of the regiment. The Japanese attitude towards the Mikado

and towards Japan is one that we cannot understand, or they explain to us; but it is said to be one of the uttermost devotion.

What single factor can be a greater influence for good in any personnel than a spirit that fears no pain, or danger, and binds all together in a vehement devotion to a common cause?

Discipline.—Of course, it is one of the efforts of discipline to keep down in men any tendency to resist the will of the directing authority; this is usually done by a system of punishments. It is also an effort of discipline to develop a tendency to assist the will of the directing authority; this is usually done by a system of rewards. There has also come into existence, within the past few years (or, more correctly speaking there has been very greatly developed from a very small beginning,) another plan for developing this spirit of assistance, and this is by developing a spirit of competition—a method very largely used in commercial life, but not much used in the navy until lately.

All these methods recognize discipline as merely a means towards an end, and not an end in itself; a means that takes account of a man as a man.

Or, it may be said, by no very great stretch of the meaning of words, that they take account of man as a certain kind of machine, and employ certain ways of actuating him, which are efficacious because of certain definite properties that characterize a man. It may be said that if we get a man to do a thing by giving him a dollar, we are actuating internal mechanism just as much as if we put a penny in the slot of an automatic vendor.

Perhaps there is a little truth in this idea, even though it seems somewhat uncomplimentary to the human race; and, it makes us realize that, in order to handle men well, we must understand the motives by which they are actuated, so that we shall know which button to press and when; and know that some buttons ought not to be pressed at all. Not only this, but it makes us realize that no two men can be treated in exactly the same way, or even one man on two different occasions. We all know this in the abstract, and yet how few of us utilize our knowledge well!

But even if some of us lack that keen apprehension of human nature that some people have, and that exceedingly skilfullness in knowing just what, and when, and how, to say and to do, we can at least note a few general truths which are of almost universal application, and which some few people seem to know intui-

tively and apply unconsciously, or at least without effort. These truths are of the simplest kind; and an appreciation of them leads us to see how some officers always get their work done efficiently, without seeming to have any trouble with their subordinates; while others, who do not accomplish any more are perpetually reporting somebody to somebody for something, and are in hot water with some one nearly all the time. Certainly this phenomenon is apparent everywhere; certainly it is important; certainly it must be in accordance with some rules or laws:—and yet where are those rules and laws to be found?

While the writer does not pretend to know much about this himself, he ventures to suggest that it has to do very closely with the presence or absence of sympathy. Of course, sympathy does not mean a disposition to allow a subordinate to continue in neglect or wrong-doing, simply because such neglect or wrong-doing may be convenient to the subordinate; but it does mean a correct appreciation of the rights of that subordinate as a man, and of the fact that we can do nothing but harm by needlessly wounding him. It recognizes the fact that he has feelings, or ought to have; that he has pride or ought to have,—and it even realizes the fact that no man can walk a line exactly straight, and that certain waverings to the right and left must be allowed to every man. All attempts to regulate the lives of men with a degree of rigidity which is greater than the power of man to be rigid, must be mistakes due to a fundamental ignorance of human nature. They are like the constant exhortation "Keep quiet," which some unthinking parents repeat from morning to night to their little children, whose restless little bodies were not intended by the Almighty to keep quiet, or he would not have made them so restless.

Another truth, which one almost blushes to mention, because it is so commonplace, is the one expressed in the old adage, "Example is better than precept." If the officers in one ship tried as hard as they could to do all their duty as well as they could, and were considerate towards each other and towards the men; while the officers of another ship, of equal professional knowledge and experience, did not try very hard to do their duty, and were perpetually wrangling with each other, and were unjust and inconsiderate towards each other, and towards the men, is there any possibility that the discipline in the second ship could be as good as in the first?

Example is better than precept; and the higher the position of the man who sets the example, the greater the effect. Can the captain who is habitually surly and rude expect that his officers and men will be habitually respectful and polite? Can the executive officer who indulges in the luxury of saying cutting things to his subordinates expect that they will say respectful things of him or feel respectful towards him; or can he expect that, on some occasion, the restraint of discipline will not be broken down, with the inevitable court-martial afterwards? Can the watch officer who is negligent and unobserving expect that the boatswain's mates, coxswains, and lookouts will keep on the *qui vive?*

At one time, flogging was used in the navy as a means of discipline; but flogging was abolished, and it was found that the ships got on just as well without it. Since that time, the treatment of the enlisted men in the service has been getting better and better, and the only results have been good results. Of course, this does not mean that flogging may not have been necessary at one time; in fact there is very good reason to believe that it was necessary. Sixty years ago, men were not so well educated as they are in the United States today. But now our public school system, and the strictness with which order is maintained in our tremendous cities, are such that most children absorb an understanding of the necessity and value of obedience to authority, long before the age at which young men enter the navy. This condition of things has been growing gradually with the years; so that men, when they enlist in the navy, have already learned a certain measure of obedience. Therefore the gradually increasing gentleness towards the enlisted man has been merely a continuous adaptation to changing conditions, due to the necessity of getting good men into the navy and keeping them.

But if it has been desirable in the past to have good men in the navy, it is becoming more so, and will continue to become more and more so, with every advance made in mechanism and invention, and with every attempt to make our organization what it should be, a system of trustworthy units. In every machine, no matter how magnificent, its perfect working is dependent upon even the smallest parts. A few grains of sand in the main bearings may stop the mightiest engine; the failure of an electrical contact may cause a disaster; the mistake of a spotter, or an error in some sub-station, may lose a battle.

Organization.—An organization of men is strikingly like a living organism in that it comprises a number of branches which have functions that are separate, are each separately necessary to the life of the whole, and yet are mutually dependent, and are themselves sub-divided.

It seems to be a law of nature that the more highly organized the structure of any living organism, that is, the higher it is in the scale of nature, the more complex is its structure, and vice versa.

It is the same with organizations. The simplest kind of an organization is one in which there is only one kind of thing to do; the boss managing a gang of street sweepers is an illustration of this kind of organization. Somewhat higher we find the organization of an infantry company, in which the number of things to be done is not very great, and the number of divisions is not very great. The most complex organization and the one in which there are the greatest number of different kinds of things to do, is a modern navy. Between a modern navy and a gang of laborers are thousands of organizations of different degrees of complexity; and through them all we see the same law running, that the higher the order of the organization and the more multifarious its faculties, the more complex it is.

The idea of organization is, of course, to get the combined effort of many men to produce a desired result; the whole effort being directed by one man, the head of the organization. This man cannot control directly a very large number of men, but it is plain that the number will decrease in proportion to the number of kinds of things that have to be done. For instance, one man might control 10 men very efficiently, if they were all doing the same thing in front of him, say sweeping a street; but he could not control 10 men very well, if they were in places far apart, and doing 10 different kinds of things.

Few organizations are so small and so simple that one man can personally direct efficiently all the men in the organization. Even in the simplest organization, it is necessary to divide the organization into parts, each under the control of a chief, and then to subdivide those parts. In fact, the idea of division and subdivision and sub-subdivision, seems inherent in the very idea of organization. If one man could control 10 other men perfectly, then one man, assisted by 110 men, could control 1000 men perfectly, and get done a thousand times as much work as one man can do.

But no man can control 10 men perfectly; and the result is a loss of efficiency that increases with the number of subdivisions. Suppose, for instance, that one man could control 10 men, with an efficiency of, say 90 per cent so that he could get the work of 9 men out of those 10 men. Suppose, further, that each of these ten men under him could also handle ten men with an efficiency of 90 per cent and each of those ten men could handle 10 men with an efficiency of 90 per cent. It will be seen that the first man would practically control perfectly, 9 men; that these nine men would control 81 men, and that those 81 men would control 729 men. That is, the first man instead of getting done a thousand times as much work as one man can do, could get only 729 times as much work done, although he would have 110 men to help him get it done. That is, the efficiency would be E^n, where n represents the number of times the organization is divided and subdivided.

This shows that in every organization the effort should be to keep down the tendency to subdivide, and the organization kept as simple as the different kinds of work to be done permit. Of course, even if only one kind of work is to be done, division and subdivision must be used if the organization is large. For instance, no colonel could handle personally a regiment of say a thousand men; and, except under peculiar circumstances, no colonel and ten captains could handle personally ten companies. The number of men that one man can handle efficiently depends, of course, on numberless circumstances; but it seems clear that the effort should be made to make this number as large as possible, by proper methods, so as to reduce the tendency to subdivide. One conclusion seems plain; and that is the number of men one can handle increases with the similarity of the men and their tasks; so that it should be the aim to make the units into which the organization is divided as similar as possible,—like the companies in an infantry regiment. This does not mean that any attempt should be made to make the units in the steam engineering department like the units in the ordnance department, because the functions of the two departments are utterly unlike. But it does mean, for instance, that two like units—say two gun divisions on the same deck—should not be clothed in different uniforms, receive different rates of pay, or belong to different branches of the navy.

Yet such a state of affairs exists on board our most modern ships, where no expenditure of time, money and mental effort has been spared, to make the ships the best that can be made. The Marines, who form so large a part of the complement of our ships, perform the same duties as ordinary seamen can, duties of the simplest kind, and yet they have an entirely separate organization, accounts, and *esprit de corps.*

Co-ordination.—A good illustration of co-ordination is to be found in a highly trained orchestra, in which we see many performers, not only playing different instruments, but different kinds of instruments, these different kinds of instruments playing different notes, and often in different time. And yet, under the sway of the skilled director, the result is the sweetest harmony we know.

The attainment of co-ordination is perhaps the most difficult part of the work of the head of a great organization. He himself, decides what policy he shall pursue in the relations of the organization to the external world, taking as much advice, or as little, as he may choose from his advisors and subordinates. In the line of external policy he is entirely independent of them; but when he attempts to co-ordinate their efforts along that line he is very dependent on them; and his ultimate success wil be a function of his success in co-ordinating their efforts.

The most obvious difficulty lies in the possible unwillingness of some subordinate to follow the line laid down. In a strictly military or naval organization this difficulty is not often met; and it would be a strange failure of the purpose of such organizations if that difficulty were often met; because their main purpose, as organizations, is—and always has been—to effect co-ordination. But in semi-military and other organizations, the difficulty is frequently met, and is sometimes extremely difficult to overcome. Often it cannot be overcome except by the removal of either the subordinate or the chief.

Another difficulty in effecting co-ordination lies in preventing the overlaping of the work of one division over the work of another division. Inasmuch as it is essential that there shall be no gaps left between the works of the different divisions, it is practically impossible to prevent a certain amount of overlapping; and here is always an abundant source of trouble. A curious phase of this trouble is that the more efficient and energetic the various divisions are, the more trouble there is apt to be.

Undue interference with the work of any division by a superior, is another source of trouble. No man in authority can have a good grip on his men, if a superior is continually interfering between him and them. Not only does it make him uncertain as to what he is expected to do, and can do, but it lessens his influence over his men; and this, not only because they cease to regard him with as much respect as they otherwise would, but because they naturally come to look to the higher chief, not only for directions, but also for promotion.

One of the greatest holds that the head of any division has over his men, is the fact that his men must look to him for promotion, or, more strictly speaking, recommendation for promotion. This fact is inherent in organizations, because they are organizations, and must not be ignored. If a captain of a ship, in going through the engineer's department, should be struck with the efficiency or industry of some man, and promote him, without the approval of the chief engineer, he would strike a blow at the very vitals of the organization of his own ship. If his selection happened to be a good one, and the man worthy of advancement, he would do wrong just the same. And this wrong would not be an academic or theoretical wrong, but the infliction of a definite and practical injury, and lessen the respect of every man in the ship for that spirit of co-ordination and discipline which it is the captain's duty to foster.

Of course this statement, like nearly all statements, does not mean that there are no possible exceptions to it. It does mean, however, that when a case comes up in which it is proper for one high in authority to interfere between the head of any division and his men, either in directing their work, or in giving promotion, the case must be recognized, either as an exceptional one, an emergency, or else a case in which the head of the division is not doing his work well; because if he is fit to be where he is, he must be able to direct the work of his individual men, and to know better than anybody else who are worthy of promotion; *not only because he is more familiar with the requirements, but because he is not apt to be unduly influenced by acts—good or bad—which, though noticeable, are accidental or infrequent.*

A man going into a billiard room might see a player make a very difficult shot; and unless he were an expert himself, would be apt to conclude that the man was an excellent player, whereas

the man might be a very poor player, and the shot merely a "scratch." *Thousands of men in actual life have received great promotion for single acts which came to the notice of high authority when those acts were simply "scratches."* On the other hand, many a very excellent and deserving man has received a set-back, because someone high in authority happened to see or hear of some act which was in itself deplorable, but which was almost an accident, totally out of harmony with the man's habitual life, and not at all indicative of his character and attainments.

Hope of promotion is a great incentive towards co-ordination. So great care must be exercised—not only in getting the best men, but in making responsible positions as attractive as possible, and making the accompanying titles exclusive. Even if civilians think our attitude towards titles is silly (and perhaps it is), yet nevertheless every man in the world would like to have a title, provided that title meant something honorable. But what use is there in having the title "Judge," no matter how fine a judge one may be, if everybody is called "Judge?" We all crave distinction; and even if this be egoism and vanity, it is one of the strongest forces in the world; and no one who deals successfully with men ignores it.

But if the desire for the distinction of a title is due to vanity, what shall we say of the desire for the distinction of a title that conveys to the world an erroneous impression of the duties and responsibilities of the man desiring that title?

It would be idle to assert that the mere bearing of a title that signifies an untruth concerning its bearer does no harm to a man who really is what his title describes; because everybody knows the reverse. *Every man who carries a title that conveys to the world a false impression, is doing definite harm to every man who carries that title rightfully.* It has been stated that one reason why Secretary Stanton made so many Brigadier Generals at the end of the Civil War was in order to degrade the title of "General,"which Mr. Stanton wished to do because of his dislike of several generals, especially General Sherman. Whether this story be true or not, the fact that it exists shows that there is a belief in the minds of men that titles lose their value in proportion to the number of people holding them; knowing that the world is apt to accredit equally all possessors of any title, not having the time or the interest to make an examination into the exact degree in which each man has a right to his title.

Returning to the subject of co-ordination as a prime object of organization, let us remind ourselves that co-ordination may be divided into two parts, internal and external; internal co-ordination being the regulation of the various functions to produce harmonious action, and external co-ordination being the regulation of the organization as a unit with reference to the external world. Applying this idea to a navy, internal co-ordination would be the regulating of all the functions of a navy so as to produce the harmonious action of all its parts; while external co-ordination would be the regulating of the relations of the whole navy to the country of which it forms a part.

The internal co-ordination of the navy is what has thus far been touched upon in this paper, but it must be plain that its external co-ordination is at least as important.

External co-ordination must be as good as possible, or the country and the navy will not be in harmony. The country owns the navy and has a right to do with it as it wishes. Its co-ordination with the navy is effected through the President and the Secretary of the Navy. As the President has many things to attend to, he usually deals with the navy entirely through the Secretary; so that the co-ordination of the navy with the country is practically through the Secretary.

Now the Secretary is usually a man of high ability and character, well versed in the affairs of public life, and holding the confidence of the country. He is never a man of much knowledge of the navy when he first enters upon his duty; but he usually acquires enough after a greater or less stay in office to act successfully as the connecting link between the country and this curious complicated thing that is called a navy, which is so wholly different from anything else in the country that nobody outside the navy knows much about it.

There has been a great deal of criticism of the custom that prevails in Great Britain and the United States of having a civilian direct the affairs of the navy; but *how else can the navy and the country get together?* Naval officers belong to an isolated profession, which is just as technical and distinct as that of medicine; and they live so little among the people of the country, that it seems sure that, if any naval officer were made Secretary, he could not deal with Congress, the President, the newspapers, and the country at large, as well as a man can who had been doing those things successfully all his life.

This brief discussion of organization and co-ordination may perhaps be closed with the truism that, in deciding on the plan or conduct of any organization, we should keep most carefully and persistently in view the *main purpose* which it is intended to effect.

The Main Purpose.—Clearly, the main purpose of a navy is to build and maintain a fleet that can defend the country.

The factors that enter into the problem of building and maintaining such a fleet are international, political, naval, and technical. The first three factors are included in the word "strategic." The various factors, then, may all be included in the two words "strategic" and "technical."

Objection may be made to the omission of the word "tactical." While such an objection would clearly be sound, the writer wishes to state that the word "naval," as just used was intended to include such prevision of tactical probabilities as comes under the domain of strategy; and that his intention is not to speak of the tactical conduct of a fleet in actual battle, but merely of the measures to be taken in order to build and maintain a fleet that shall be able to fight that battle with success.

Now, while it is clear that the two factors, strategic and technical, are mutually interdependent and are both essential; so that neither factor should be declared more important than the other, yet nevertheless it is also clear that technical factors, in all the spheres of their employment, industrial as well as military, owe their value, not so much to their intrinsic qualities, as to the way in which those intrinsic qualities may be applied to the attainment of some desired result. A bridge builder, for instance, would not care for steel, no matter what were its qualities, unless he could utilize those qualities in building a bridge.

For this reason, all technical factors, in all the lines of their employment, must be regarded as factors contributory to the main purpose and, in a sense, subordinate. Sometimes, in fact often, the technical factors assume so much prominence that they obscure the main purpose; but this is a clear case of "human fallibility," and one against which we must most zealously and patiently guard.

It may now be asked—if the two factors in carrying out the main purpose are strategic and technical,—who are the men best fitted

to decide as to the proper policy to carry it out? The answer is clearly that, under the direction of the Secretary, naval officers are the men best fitted, and in fact the only men fitted, to decide as to the policy.

But who are "naval officers?" If one answers according to the dictionary, he will say that "naval officers are men who hold an office that is connected with a navy." If this definition be accepted, then every watchman in a navy yard, and every private marine, is a naval officer.

But this is a "*reductio ad absurdum,*" and is the result of an attempt to define in a few words what cannot be so defined. Many words in every language are so thoroughly understood, that they cannot be defined except by using words less well understood. Unless he befogs his mind by looking in the dictionary, every educated man knows perfectly well what a naval officer is. Every educated man knows that a naval officer is a nautical person, a man who goes to sea, whose work is done on the bridge, and in the turret, engine room, and fire room; whose mail is often a month late; whose life-long sorrow is his far and frequent absences from home; who handles guns, and drills men, and lives in an atmosphere of discipline and danger; who manages ships and all that they contain, and lives with them day and night; himself as essential a part of the fighting machine as one of the masts or turrets.

These men go up the successive steps of the professional ladder, more systematically and rightfully than do the men of any other calling; acquiring at each step experience to be used on the step above, and not being permitted on any step until fitness has been proved. In natural sequence, each degree of responsibility is assumed; and, the scope as well as the degree of responsibility expanding, as higher steps are mounted, and coming responsibilities cast their shadows before, the natural career of the naval officer fits him gradually, but surely, for the correct apprehension of strategic problems, and all questions of naval policy.

This does not mean that nobody should be allowed to have anything to say about the navy but naval officers, but it does mean that naval officers should be the final judges about everything pertaining to the strictly naval side of the navy. It does not mean that naval officers should decide questions of hygiene, handle the

finances, construct the ships, or build the dry-docks; because all these special kinds of work can be done better by specialists who make those special kinds of work their lifelong study and profession, in the same way that naval officers make naval work their lifelong study and profession.

SHORE DUTY.

It has been suggested very often that, in our navy, naval officers are on duty on shore entirely too much. It has even been held that there is nothing distinctly naval in any duty on shore, and that all that is required to be done on shore for the navy should be done by civilians, so that naval officers could go to sea all the time except during occasional vacations on shore.

Without insisting too much that a naval officer is a man, and not an albatross, it may be pointed out that, even if this idea were true for a non-progressive navy, it cannot be true for a progressive navy. If we are to improve our numberless mechanisms continually, the people on shore who get these mechanisms ready for the ships, and the people on board the ships who test and use them must work together, with the common purpose of improving the mechanisms and the ships: and this they could not possibly do, if they were two unlike bodies of men. They could not understand each other, the people on shore could not possibly comprehend the essential features required for the practical use of the mechanisms on board and the people on board, not having the opportunity of keeping posted in the progress of mechanism on shore, would not be able to take advantage of the new mechanisms put in, even if the people on shore produced good ones.

We must never forget that *the naval profession comprises not only an art but a science also.* If it comprised an art alone, we could master it at an early age, and spend the rest of our lives on blue water, practicing that perfected but *stagnant* art. But since it is a science too, and since every science is infinite in scope, we must master as much of it as we can; and this requires periods of comparative leisure from executive duties, in properly equipped stations on the land. There we can study the principles of naval science—as fixed as the principles of every other science—and strive to apply them to the infinitely varying requirements of the naval art and the furtherance of naval power.

CONCLUSIONS.

The reflections set forth in this paper seem to lead to the following conclusions:

1. The increased power of navies is due primarily to the progress of the mechanical arts and sciences.

2. The rapid growth of ocean traffic; the augmentation in numbers and in power of ocean ships; the increased and still increasing diffusion of knowledge; the amazing growth of mechanism; the increased and still increasing appreciation of the value of wealth; the increased and still increasing love of luxury; the development of agriculture and transportation in even savage countries, combine to increase an ocean commerce that already covers the world, though thinly, and that will probably grow ten fold in the fifty years to come.

3. "Competition is the life of trade;" competition is the same thing as rivalry; "trade rivalry" is a common expression for a condition as common as trade, and inseparable from it. There is no rivalry more bitter than trade rivalry. There is no thing more dangerous to peace. There is no thing for which men will fight more savagely than for money.

4. Three of the great powers, Great Britain, Germany, and Japan, have built up navies that are so large, compared with their foreign trade, that we are forced to infer that they have determined to fight, to maintain any stand which their trade interests may impel them to take.

5. Two of these countries have causes of complaint against us which they consider just.

6. Each country now has a navy so powerful that, in case we went to war with her, the issue would be doubtful.

7. In a few years the navy of one of those countries will be much more powerful than ours.

8. War with either country would probably entail war with the other at the same time.

9. War with both countries would cause the overwhelming defeat of the United States and the payment of enormous indemnities to both countries.

10. *The probability of this occurring within the next ten year, unless the United States builds a navy able to fight both, is so great, and the resulting expense, both in the war itself and in the succeeding indemnities, would be so crushing, that it*

would be good business to follow Great Britain's successful policy, and build a navy equal to hers.

11. We must not be content with merely building big ships and big guns. We must ransack the resources of science, to make the material as efficient as possible: and we must develop in the personnel, first the same heroic qualities which have animated the sea warriors of the past; and, second, that skill in strategy, tactics and engineering which will direct the mechanical power of the material to the most effective use.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A FILING SYSTEM FOR NAVAL VESSELS.

By LIEUT. PAUL FOLEY, U. S. Navy.

EDITOR'S NOTE.—This paper has been examined by the specialists of one of the leading filing firms in the United States, and the systems described pronounced by them to be in accord with the most advanced commercial practice.

The extent to which vertical filing and card indexing systems have invaded the entire commercial world is sufficiently well known to naval officers generally to render unnecessary any extended argument tending to prove that the introduction of such systems on board vessels of our navy will not only add materially to their efficiency, but that, in view of the enormous complements of present-day ships, with their attendant administrative problems, and of property accounts aggregating millions of dollars, the introduction of such systems has become a military necessity.

On one hand, civilian experts familiar with the mechanical details of filing cannot possibly have any thorough knowledge of the technical questions involved, and have passed the navy by for the reason that it is a fundamental filing principle that systems must be adapted to conform with requirements, rather than requirements to mechanical systems. On the other hand, naval officers have neither time nor opportunity to investigate the offerings of the filing market, and, attempting it, find themselves bewildered by its terminology, and adrift in a sea of material useful to railroads, churches, gas companies, doctors, dentists and drummers, but hardly adapted to ships.

An attempt is herein made to reconcile these contradictory conditions, and to outline the problem step by step, as it has developed on one ship during a period of three years.

The printed form which cards assume is, however, a matter of minor importance. With one or two exceptions all herein illustrated have originated in a ship's printing office. The essential things are furniture, folders, guides and cards, sizes, colors and tabs, and how to use them; how to substitute card records for book records, and how to file information so that it can be *recovered*. This is what this system *does*, and what current systems *do not do*.

It is easy enough to devise a file that an individual can understand, but to devise one that others understand is a different matter, although it is the first step in that business reform which the Congress of the United States has made a special appropriation to effect, and to which the Navy Department is committed.

By means of the systems described under General Storekeeping, the entire property account of a battleship, equipage and supplies, in all departments, with all attendant vouchers, can be preserved and administered with the accuracy of a banking establishment and independent of the personality of any individual, in cabinets whose over-all dimensions are 60 inches high and 40 inches wide. This statement is based on actual experience.

FURNITURE.

Horizontal unit filing cabinets are in general best adapted to ships' use.

THE HORIZONTAL UNIT IDEA.

Each unit fits any other unit.

Any single unit, with base and top or cornice, forms a complete cabinet.

Any number or combination of units may be brought together into one unit.

ITS ADVANTAGES.

1. *Gradual Growth.*—A vessel may begin with the smallest cabinet, a single unit, and add to this a section at a time as more capacity is needed.
2. *Much in Little.*—The greatest possible variety of filing capacity can be obtained in the smallest space.

3. *Flexibility.*—The cabinet or stack may be arranged in practically any form desired. Where deck space is limited it may be kept one unit wide, and extend to the ceiling; or it may be arranged in various heights to fit the position of air ports, doors, etc.

4. *Rearrangement.*—As a commission progresses it is often an immense convenience to divide the general file for use in different departments. The horizontal unit cabinet can be arranged to fix existing conditions at any time.

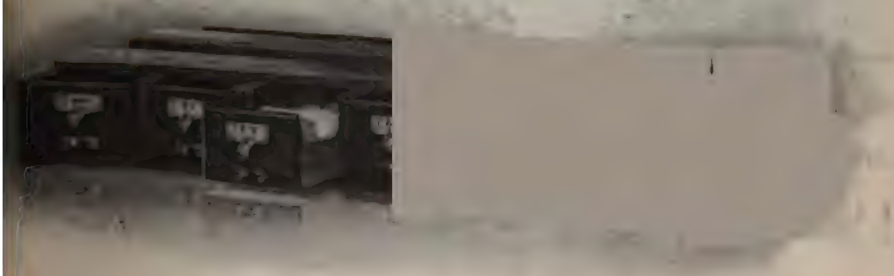
5. *Economy of Space.*—The construction of each unit leaves not an inch of waste space.

All units are one standard width, 38 5-16 inches.

Until such time at least as practice has shaped itself along standard lines it would not seem to be to the interest of the government to undertake the manufacture of filing cabinets in its own navy yards.

Not only is it improbable that it would materially improve in workmanship, but it certainly could not improve on the cost or rapid production of the standard commercial units here illustrated and recommended. These are:

For 3 x 5 cards:

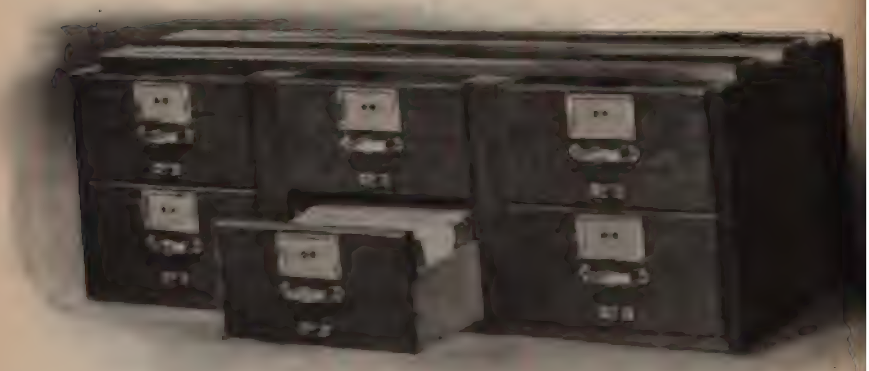


SIX-TRAY CARD INDEX UNIT.—For 3 x 5 in. cards; 4 11-16 in. high, 16 in. deep, outside. Capacity, 7200 light-weight cards with guides.

For 5 x 8 cards:

EIGHT-TRAY CARD INDEX UNIT.—For 5 x 8 in. cards; 13 in. high, 16 in. deep, outside. Capacity, 9600 light-weight cards with guides.

For new style (booklet) enlistment record:



SIX-TRAY CHECK FILE OR VOUCHER UNIT.—Capacity approximately 21,000 checks or vouchers. 11½ in. high, 16 in. deep, outside. Inside size of trays, 10 in. wide, 4¾ in. high, 14 in. deep.

For all correspondence, enlistment record (old style), requisitions, surveys and, in short, all vouchers used in the naval establishment:

Two-Drawer Legal File Unit.—Capacity of each drawer, approximately 250 folders with legal papers, correspondence and guides. 12½ in. high, 24 in. deep, outside. Inside size of drawers, 15¼ in. wide, 10 7-16 in. high, 22 in. deep.

For the filing of Naval Supply Fund stock cards (special cards hereinafter described):

With Card Index Trays.—Size and capacity same as above, with three trays for 3 x 5 in. cards. Capacity of trays, 3600 light-weight cards with guides.

For the particular use of individual officers, staff, ordnance, etc., for whom no special office is provided, and who nevertheless conduct a correspondence more or less extensive, a vertical legal

right. By reversing a folder, turning it inside out, a right folder becomes a left and vice versa.

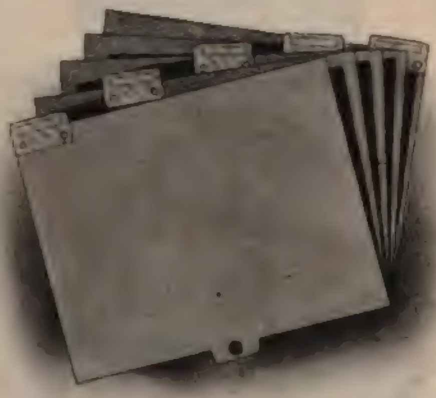
Folders are required and may be obtained in four colors, *manila, blue, salmon and yellow.*

Guides.

Guides are partitions used to separate and classify correspondence. The best and most durable type for the heavy duty required are:

Metal Tip Guides.

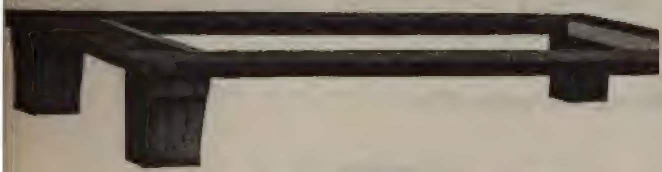
They are one of the best new developments in the vertical filing equipment. There is no practical limit to their durability. All



guides wear out on the tabs, which become soiled and illegible and dog-eared. The metal tip guide cannot wear out because the tip is metal.

The metal tip guide is entirely rigid and supports the folders or papers in the file, keeping them compact, erect and in alignment. This stiffness also facilitates reference, making the guide useful in "throwing" the contents of the file forward or backward in consultation.

One of the most important features of all is that the guide heading of the metal tip can be changed at any time: merely insert a new slip in the metal tip. This means that as the file



Low-Leg Base Unit.—17½ in. high, 16 in. deep.

STATIONERY.

The stationery equipment of the foregoing cabinets includes:

Folders, legal and correspondence.
Guides, assorted sizes and types.
Cards, assorted sizes.

Folders.

Folders are simply open-ended envelopes in which papers may be filed on edge instead of flat, whence the term vertical filing.

All folders have a back edge projecting a half inch on which number, name or subject may be entered. When the back projecting edge extends only half across the width the folder is said to be "half cut." Such folders are filed alternately left and

Guides labeled alphabetically, numerically, monthly and yea
are required in both sizes, and in three colors, buff, blue a
salmon.

A-Z guides. 125 subdivisions of alphabet.

Blank guides may be labeled on board ship by means of
ordinary rubber-type outfits furnished pay departments. Th
should be stamped on both sides, as by doing so they beco
interchangeable, right or left, simply by reversal.

Celluloided Guide.

A yeoman of average capacity should be able to set up a
stamp in rubber type twenty-five guides or folders per hour.

Stock alphabetical guides are required in the 25, 55 and 1
subdivision sets. A few sets of daily, weekly and monthly gui

are also useful. For all such the type known as "celluloid" is the best on the market. They are unsurpassed for durability, cleanliness and ease of handling.

After the guide is printed a sheet of celluloid is folded over the edge of the guide projection front and back, and firmly cemented.

On this reinforced projection comes all the wear of the guide. It cannot become dog-eared or soiled and adds a rigidity to the guide which facilitates handing to a marked degree. In a permanent card record it is by far the cheapest guide in the end.

INDEX CARDS.

For the various special conditions that develop in the course of filing, horizontal ruled cards in the 3 x 5 and 5 x 8 size may be obtained in six different colors: White, buff, blue, salmon, green, fawn.

The color variety is particularly useful in printing labels for use with metal tip guides. By varying the label color it is possible to get all the advantages of separate color cards.

NAVAL FILING SYSTEMS.

Having outlined the mechanical equipment used in modern filing, follow the particular application of such equipment to shipboard requirements, beginning with

The Captain's Office.

All correspondence of any kind, official or unofficial, is filed in one continuous file, a "numeric file." This file, although described for the captain's office, is equally applicable to the filing of any kind of correspondence whatever, from that of an individual to that of a flagship.

Numerical Filing.

It is the most practical and scientific and most widely used. It simplifies the most complicated correspondence, and insures absolute accuracy and quickest reference.

Tough manila folders of uniform size are numbered from on upward and filed consecutively. In each folder all the letters t

and from one correspondent or concerning one subject are place in order of date, those of the latest date in front.

Alphabetic card index. Gives instant reference, by number of folder, any correspondence filed.

Every letter received and copy of every letter sent are marke with the number of that correspondent's folder, and the yeoma who files goes simply by the number. There is no chance fo guess work or error.

The Card Index.

The index to correspondence is kept in a card index. One card is made out for each correspondent or subject, bearing name and address, and the number of that correspondent's or subject's folder. This card is filed in an index tray alphabetically.

To find the number of folder containing any desired correspondence refer to index card.

The index card once made out, indexes a correspondent or subject forever.

Index card. Carries name and address of correspondent or subject, and number of folder. Other data if desired.

When the subject of filing ship's correspondence was first investigated, a system of classification by bureaus of the Navy Department was adopted. The theory of such classification was excellent, but in practice did not work. The following example will illustrate why:

The pay officer of a ship addressed a letter to the commanding officer asking that two additional electric bake ovens be purchased. Appended to the letter were letters from the various manufacturers of this article.

The commanding officer approved of the purchase, and addressed a separate letter to the chief of Bureau of Equipment,

asking that the requisition be approved. To this letter was appended the letter from the pay officer.

The chief of Bureau of Equipment referred the matter to the Bureau of Supplies and Accounts, and in addition wrote for additional data concerning the ovens.

The chief of Bureau of Supplies and Accounts placed an endorsement on the original letter, and wrote the commanding officer direct, asking for other information.

The commanding officer replied to the Bureaus of Equipment and Supplies and Accounts—the one by an endorsement on the original letter; the other by a letter direct.

Letters and answers are filed in folder in order of date.

Equipment also referred the letter to Navigation, which reference resulted in an endorsement and a letter.

The pay officer furnished the commanding officer with all additional information required, which information was forwarded to the respective bureaus under separate covers.

The original letter was finally returned, scarred almost beyond recognition, approved—the pay officer being directed to purchase the two ovens, which had been asked for about three months previously.

The pay officer ordered the two ovens from the General Electric Co.; but received a letter from them stating that they could no longer furnish ovens at the price quoted several months previously.

Letters were exchanged between the pay officer, commanding officer, the Bureau of Equipment, Bureau of Supplies and Ac-

counts and Navigation, and finally the estimated cost was increased enough to allow of the purchase being made.

The matter having been arranged satisfactorily, and the bake ovens being on board, the captain's yeoman proceeds to sort out this correspondence and files it away. He finds that he has correspondence with Navigation, Equipment, C. & R., S. & A., and much general correspondence.

By bureau filing it would be practically impossible to ever relocate this correspondence. By numeric filing it is very simple. All the correspondence is sorted and arranged according to date, and is placed in *one* folder. The procedure is as follows:

1st. The subject of the correspondence is decided to be "Ovens, Electric Bake."

2d. An index card is made out for this subject. Ovens, Electric Bake, is typewritten in the upper left-hand corner of the card; the number of the folder that is to contain the correspondence is placed in the upper right-hand corner of the card; in the lower left-hand corner is written the name of the classification of the letter.

3d. In order that anyone unfamiliar with the correspondence may be able to locate it, the cards are now cross-indexed, and cards are made out as above with the following subjects:

a. Bake ovens, electric.
b. Electric bake ovens.
c. General Electric Co.
d. Westinghouse Electric Co.

The last two references are necessary because several letters concerning the purchase of the ovens had been received from these firms, and different members of these firms had signed their names to them, so that no one would be likely to recall the names of the writers after several weeks had elapsed.

4th. A folder is selected, and the subject of the correspondence is placed thereon: Ovens, Electric Bake. In this connection, it is desirable to make a neat appearance of the folder. This is best done by setting up type for each subject, and stamping it on the folder.

5th. The consecutive number of the folder is now stamped on it, and typewritten on each index card referring thereto.

6th. In order to facilitate replacing correspondence in the proper folders when much correspondence has been taken out, the number of the folder and the class of correspondence to which each letter belongs is typewritten on the top of each letter before it is filed away.

7th. Should there be correspondence concerning other kinds of bake ovens, steam for example, it should be placed in a separate folder, and have separate index cards referring thereto.

8th. In order to facilitate rapid reference, in case this correspondence is desired at the same time as the rest, each index card should be cross-indexed. Thus, if the correspondence concerning the steam bake ovens is to be placed in Folder No. 26, there should appear on the index cards for the Electric Bake Ovens the following reference:

SEE GENERAL CORRESPONDENCE FOLDER NO. 26.

And on that corresponding to the Steam Oven Folder the following:

SEE GENERAL CORRESPONDENCE FOLDER NO. 51.

These directions may appear very complex, but in reality they boil down and make the whole very simple, as shown by the Index Card concerning Ovens, Electric Bake:

INDEX CARD—SIZE 3 x 5 inches.

Ovens, Electric Bake. #51

See Gen. Cor. Fol. #26.

General Correspondence

Alphabetical File.

SAILING ORDERS.

For the filing of sailing orders an Alphabetical File is a convenient help. The Alphabetical File differs from the Numerical File only in that the guides are alphabetical. It eliminates the card index, but is not susceptible to cross reference.

One folder is used for each *place*, in it being placed all orders to that place, and all telegrams from the commanding officer reporting arrival at or departure from that place. For example:

Orders are received at Hampton Roads to Kingston, N. Y.

These orders are filed in a folder, marked "Kingston, N. Y."

The telegrams to the Department reporting sailing from Hampton Roads for Kingston, and the reporting of arrival at the latter place, are filed in the "Kingston, N. Y." folder.

An order from the Department to remain at a place is consid-

ered a sailing order, and would be filed as follows: "Remain Colon." Index Card filed in the C's.

Orders giving an itinerary including more than one place are copied, and one copy of the order is placed in each folder of the places referred to. The original order being placed in the folder of the place first visited.

Upon the arrival of a ship at a place, there is in general much to be attended to, and relating to this are many papers. In order that no matter may be neglected, as might be the case should the commanding officer not keep a pocket file, all letters and papers relating to what is to be done at the next port of call are placed in one folder, marked "Next Port," regardless of the subject matter, and as soon as any one of the matters referred to is completed, the letter or paper is replaced in its proper folder.

This folder, it will be understood, is not a permanent folder, but temporary instead, and is used merely to afford a means of checking up what is to be done and what has been done.

Letters Sent.

In order to keep an accurate record of all letters sent from the commanding officer's office, and also for purposes of reference, all letters are numbered consecutively, regardless of who writes them, the initials of the writer being prefixed to show who is the author.

Each letter is assigned a card, showing the number of the letter, the writer, the date the letter was written, to whom it was addressed and the subject matter. Thus:

Date:	January 1, 1910	DGC-1
To	Secretary of the Navy, Bureau of C & R	
Subject:	Ovens, electric bake, Increase cost of	

The above form shows that on January 1, 1910, clerk DGC wrote a letter, No. 1, for the commanding officer to the Secre-

tary of the Navy, through the Bureau of Construction and Repair, concerning the increased cost of the Electric Bake Ovens.

These cards are filed behind numerical guides. They do not refer to any folder, but are merely intended to give a ready means of checking up any particular letter about which there may be some question.

Transferring Correspondence.

Let the current file run for whatever fixed period is convenient, a quarter, two quarters or a fiscal or calendar year, then go through the folders and transfer all matter more than the selected date back. Place this transferred correspondence in folders in

Transfer box.

transfer boxes, labeling each box with the number of the first folder which it contains; the first only; for instance 21.

This leaves one period's correspondence in the current file.

At the end of another period repeat the operation, combining the correspondence from each folder transferred with the correspondence from the folder which has been previously transferred. This method repeated on every transfer collects the papers on any subject, or to and from any correspondent, in one place in the transfer box, making it as easy to refer back five years as one, and after dates of individual letters have been forgotten. The importance of this point cannot be too strongly

emphasized. There is always only one place in the transfer file to look for given transferred correspondence.

This method is flexible and absolutely expansive without limit. Should a transfer box become too crowded after several transfers are made to it, another box may be put on the shelf next to it, and the folders in the first box distributed in the two boxes.

For instance, suppose a transfer box contains ten folders, beginning with the folder 190; the box is labeled "190," when this box becomes too crowded take out five of the folders and put them in another box, which is inserted next to the first box. Number the new box "195," being the number of the first folder it contains. By this method the label on the box is never changed.

Note also that the transferred correspondence with its possibility of indefinite expansion takes only the space necessary for the present size.

It is not necessary that the work of transferring be done all at once—yeoman can transfer gradually at odd times.

Reference to the transferred files is reduced to a minimum since current matter remains for a reasonable time back in the current file. The numbers of folders are alike. The card index continues the same; there are but two places to look; this for all time.

GENERAL STOREKEEPING.

The entire work of the centralized General Storekeeping Establishment distributes itself under the following heads:

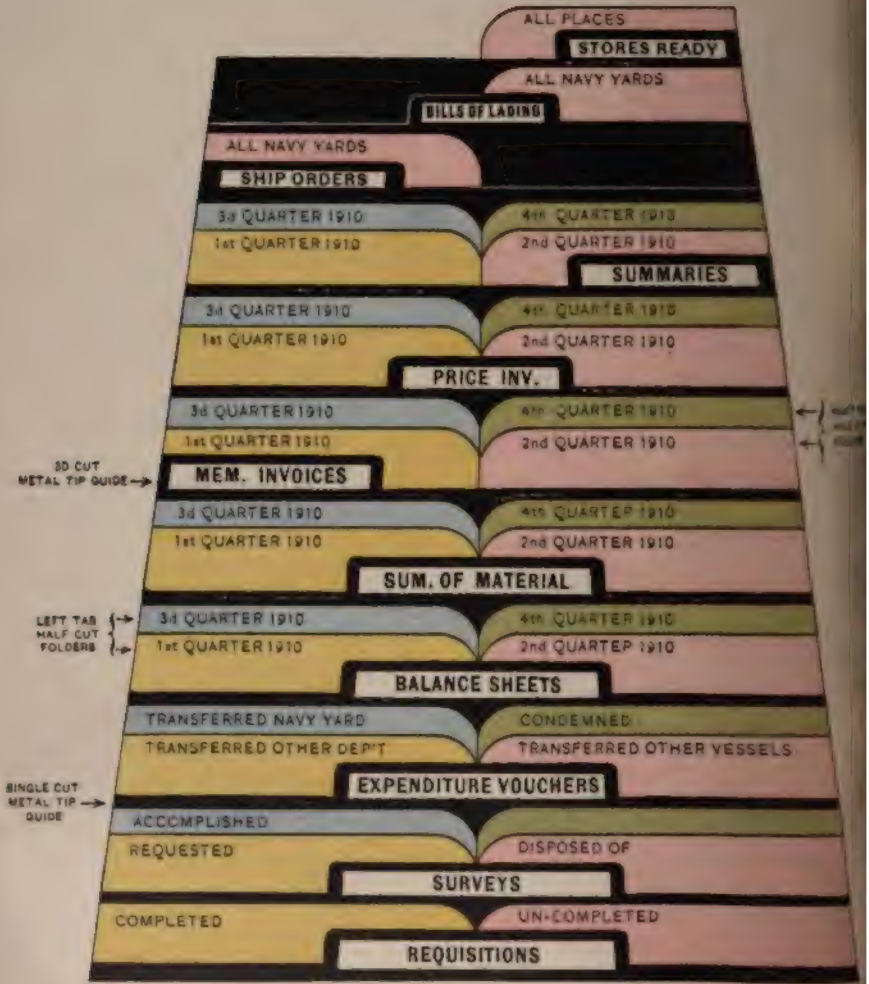
1. General file papers all departments.
2. Naval supply account.
3. Equipage account.
4. Orders on purchasing officer.
5. Receipts from purchasing officer.

Providing for these, it follows that the problem is simplified, even solved, at once.

Vouchers.

The vouchers pertaining to each bureau of the Navy Department are filed in legal cap folders behind special guides, as illustrated in the diagram, Form 1.

Use a separate drawer for each bureau of the Navy Department.



Form 1.

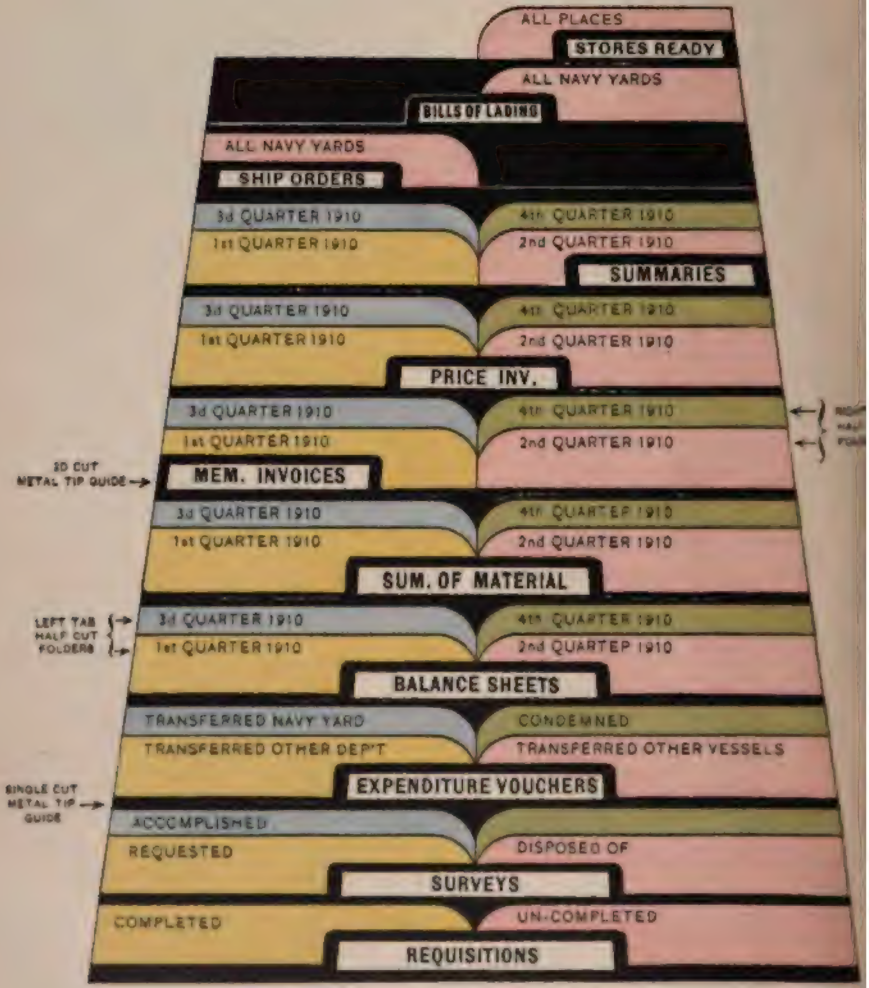
PERSPECTIVE VIEW OF ARRANGEMENT OF DRAWERS, GENERAL STOREKEEPING VOUCHERS.

Class No. 52 LEAD, WHITE, IN OIL. Locker No. 280

RECEIPTS								EXPENDITURES								BALANCE.	
DATE	INV. NO.	FROM	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLLARS CTS.	AV'GE PRICE	DATE	STUB NO.	VESSEL	DEPT.	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLS. CTS.	QUANTITY	AMOUNT DOLLARS CTS.
5-2-10	1950	Charleston	3000	Lb.	.07	210 —		5-25-10	957	Lamson	Cons	100	Lb.	.07	7 —	2900	203 —
								5-23-10	774	Smith	"	150	"	.07	10 50	2750	192 50
								5-24-10	787	Flusser	"	100	"	.07	7 —	2650	185 50
								5-24-10	843	Dixie	"	600	"	.07	42 —	2050	143 50
								6-15-10	897	Flusser	"	100	"	.07	7 —	1950	136 50
								6-14-10	877	Preston	"	50	"	.07	3 50	1900	133 —
								6-16-10	925	Lamson	"	100	"	.07	7 —	1800	126 —
								6-22-10	954	Smith	"	50	"	.07	3 50	1750	122 50
								6-30-10	968	Dixie	"	300	"	.07	21 —	1450	101 50
7-7-10	220	Boston	3000	Lb.	.0564	169 23		8-1-10	84	Smith	"	200	"	.06102	12 20	5250	320 53
7-19-10	460	"	1000	"	.062	62 —	.06102	"	77	Flusser	"	100	"	—	6 10	5150	314 43
								"	113	Reid	"	100	"	"	6 10	5050	308 33
								8-25-10	217	Dixie	"	300	"	"	18 31	4750	290 02
								9-1-10	282	Lamson	"	200	"	"	12 20	4550	277 82
								9-16-10	343	Flusser	"	100	"	"	6 10	4450	271 72
								9-19-10	350	Dixie	"	200	"	"	12 20	4250	259 52
								9-21-10	455	Smith	"	200	"	"	12 20	4050	247 32
10-19-10	8605	New York	1000	Lb.	.057	57 —		10-31-10	463	Dixie	"	450	"	.0639	28 76	8600	549 56
10-28-10	10030	" "	4000	"	.0585	234 —	.0639	11-15-10	509	Preston	"	200	"	"	12 78	8400	536 78
								11-26-10	554	Flusser	"	100	"	"	6 39	8300	530 39

BALANCE CARRIED FORWARD

FORM 2. (Reduced Size.)



Form 1.

PERSPECTIVE VIEW OF ARRANGEMENT OF DRAWERS, GENERAL STOREKEEPING VOUCHERS.

Class No. 52 LEAD, WHITE, IN OIL. Locker No. 230

RECEIPTS								EXPENDITURES								BALANCE.	
DATE	INV. NO.	FROM	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLLARS CTS.	AV'GE PRICE	DATE	STUB NO.	VESSEL	DEPT.	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLS. CTS.	QUANTITY	AMOUNT DOLLARS CTS.
5-2-10	1950	Charleston	3000	Lb	.07	210 —		5-25-10	917	Lamson	C&R	100	Lb	.07	7 —	2900	203 —
								5-23-10	774	Smith	"	150	"	.07	10 50	2750	192 50
								5-24-10	787	Flusser	"	100	"	.07	7 —	2650	185 50
								5-24-10	843	Dixie	"	600	"	.07	42 —	2050	143 50
								6-15-10	897	Flusser	"	100	"	.07	7 —	1950	136 50
								6-14-10	877	Preston	"	50	"	.07	3 50	1900	133 —
								6-16-10	925	Lamson	"	100	"	.07	7 —	1800	126 —
								6-22-10	954	Smith	"	50	"	.07	3 50	1750	122 50
								6-30-10	968	Dixie	"	300	"	.07	21 —	1450	101 50
7-7-10	220	Boston	3000	Lb.	.0564	169 73		8-1-10	84	Smith	"	200	"	.06102	12 20	5250	320 53
7-19-10	460	"	1000	"	.062	62 —	.06102	"	77	Flusser	"	100	"	"	6 10	5150	314 43
								"	113	Reid	"	100	"	"	6 10	5050	308 33
								8-25-10	217	Dixie	"	300	"	"	18 31	4750	290 02
								9-1-10	282	Lamson	"	200	"	"	12 20	4550	277 82
								9-16-10	343	Flusser	"	100	"	"	6 10	4450	271 72
								9-19-10	350	Dixie	"	200	"	"	12 20	4250	259 52
								9-21-10	455	Smith	"	200	"	"	12 20	4050	247 32
10-18-10	8605	New York	1000	Lb	.057	57 —		10-31-10	463	Dixie	"	450	"	.0639	28 76	8600	549 56
10-28-10	10030	" "	4000	"	.056	224 —	.0639	11-15-10	509	Preston	"	200	"	"	12 78	8400	536 78
								11-26-10	554	Flusser	"	100	"	"	6 39	8300	530 39

BALANCE CARRIED FORWARD

FORM 2. (Reduced Size.)

The vouchers filed in this way include:

Requisitions.
Surveys.
Expenditure Vouchers.
Balance Sheets, Quarterly.
Summaries of Material, Title " Y."
Memorandum Invoices.
Price Invoices.
Store Summaries.
Shipment Orders.
Bills of Lading.
Notices of Stores Ready for Delivery.

The filing diagram is believed to be self-explanatory.

Office Correspondence.

File the correspondence of the office other than the property account vouchers in an ordinary numerical vertical file with card index.

General Account Advances.

NAVAL SUPPLY FUND, TITLE " Y."

For each item of stock carried under this account provide a card, *correspondence* size, 9½ x 11 13/16 inches, as shown in special Form 2.

These forms are ruled alike on both sides.

File them behind *numerical class guides,* with additional alphabetical guides in classes *12, 13, 17, 41, 42, 45, 52, 53* and *54.*

Upon superficial examination this stock card might appear to be only a card. A closer examination, however, will reveal that it shows:

1. The " class " of the item.
2. Its catalogue number in accordance with a special reference catalogue arranged as per following sample page:

G	Article.	Class.	Unit.	Price.	Remarks.
G-53	Graphite, Plumbago.	52	Lb.	.14	Flake in 5 lb. tins.
G-54	Grease, Albany.	14	Lb.	.075	In 5 and 25 lb. tins.
G-55	Grommets, brass, No. 3.	42	Gro.	.97	Sailmakers' grommets for canvas in 1 gross boxes.
G-56	Grommets, Spur, No. 2.	42	Gro.	.97	
G-57	Grommets, Spur, No. 3.	42	Gro.	.97	
G-58	Grommets, Spur, No. 4.	42	Gro.	.97	
G-59	Grommets, gage glass, 1/2.	33	Doz.	.08	
G-60	Grommets, gage glass, 5/8.	33	Doz.	.08	
G-61	Grommets, gage glass, 3/4.	33	Doz.	.08	
G-62	Guards, Type A.	17	No.	1.20	Electrical fitting for steam tight globes.
G-63	Gum, Camphor.	51	Lb.	.60	In 1 lb. rectangular cakes.
G-64	Gum, Strip, 3/8x5/16.	33	Lb.	.80	Rubber, in lengths of 12 feet.
G-65	Gum, Strip, 5/8x5/16.	33	Lb.	.80	
G-66	Gum, Strip, 5/8x3/4.	33	Lb.	.50	
G-67	Gum, Strip, 3/4x1/2.	33	Lb.	.80	
G-68	Gum, Strip, 3/4x3/4.	33	Lb.	.75	
G-69	Gasoline.	8	Gal.	.21	In 5 gal. tins and 50 gal. drums.

3. *The normal quantity carried.*

4. *Where stowed in the ship.*

5. *The rate of issue for any period.*

6. *Balance for quantity or value or both at any time.*

Record of Stub Requisitions.

File all stub requisitions for each bureau in the drawer containing the vouchers of that bureau. Use a single-cut guide labeled *stub requisitions,* with folders labeled *1st, 2d, 3d and 4th quarter,* as for the other vouchers.

This special label is not shown in the diagram.

Money Allowance.

When vessels are operating on a money allowance the state of the account from day to day can be kept on the special form card No. 3.

File these in the voucher drawer behind a single guide labeled *money account.*

Certain items of stock carried under the Naval Supply Fund, oil for example, are not properly charged against the money allowance. It might readily happen, however, that a stub requisition would contain such an item among others that are properly charged against the account. To meet this condition, charge against the account the full face value of the stub, and credit the

U. S. S. [redacted] Serial No. for Ship. **7**

1910		Amount Credited	Amount	Date		Charged Invoic No.	Amt.
July	1	Allowance for 6 months	2765 —	July	1	On hand by inventory	844 88
July	31	By Special Order #10	34 80	July	31	Drawn from G.S.K., "Dixie"	34 80
Aug	31	Do	270 —	Aug	31	Do	844 99
Sept	30	Do	54	Sept	30	Do	358 51
Oct	1	Turned into store by expenditure #10	17 36	Aug	17	By P.B. #87 (Hughes)	2 —
				Oct	31	Drawn from G.S.K., Norfolk Va., Inv. nos. 3877, 3861, 3842, 4076, 4072, 4075, 4700, 4702, 4703, 4385, 3716, 3813, 3788, 3978, 4701, 4771, 4769, 3698, 4085, 4078, 4479, 4518, 4109, 4090, 4519, 2809, 3639, 3794, 4704, 3787, and 4117.	
Oct	31	By Special Order #10, Inv. nos. 3698, 4085, 4078, 4479, & 3787 (1 item). total	192 75			Total	521 39
Nov	30	By Special Order #10	59 79	Nov.	30	From G.S.K. "Dixie"	371 73
		Total Credit.	3339 24			Total.	2977 80
		Total Charged	[illegible]				

account with the value of the excepted article. The balance will always be correct.

Orders for Purchasing Office.

Under the new organization the pay officer of the ship is in effect a purchasing agent and as such prepares all requisitions.

Every department of the ship is supplied with other cards similar in form to that of special Form 5 on which it makes its orders on the pay office. When it is necessary to use technical description in the preparation of requisitions, such description is entered on the card by the technical expert.

When the requisition has been prepared according to the card data given, the general storekeeper's responsibility ends.

File these cards behind numerical guides by departments.

Record of Receipts.

A form similar to that shown in special Form No. 6 is used to notify the ship departments of the receipt of material.

File these receipts behind numerical guides by departments.

Equipage, Title "B."

File the itemized inventory of equipage for each department of the ship on individual cards, 3 x 5, ruled as per special form No. 7.

One side of this card covers *receipts,* the other side covers *expenditures.*

File these cards alphabetically by departments behind *numerical class guides.*

Custody Receipts.

Custody receipts, Form 8, shown front and reverse, are filed wherever necessary behind the item card pertaining thereto.

Req. No. **Required in** Steam Eng **Dept.** Date 8/17/09 191

Quantity	Description	Estimated Cost
No 4	Klinger Reflex Water Gauges #7 complete, with spare glasses for each.	$100.00/100

Special purpose required To replace present installation double scotch glasses on main boiler.

Order from firm Ferguson Mfg Co — Boston Mass

Proprietary Article (Yes, no) Yes

Wanted by what date 9/1/10

Submitted by

Approved

The following material has been received from Ferguson Mfg Co for the S. Eng Dept.

Quantity		Description.
No	4	Klinger Reflex Glasses, complete with spare glasses

If there is a criticism of the material mark a cross here...... and report on back of this slip.

John Smith P.A. Pay U. S. N.

General Storekeeper.

FORM 6.

Req. No. **Required in** Steam Eng **Dept.** Date 8/17/09 191

Quantity	Description	Estimated Cost
No 4	Klinger Reflex Water Gauges #7 complete, with spare glasses for each.	$100 00/100

Special purpose required To replace present installation double scotch glasses on main boilers.

Order from firm Ferguson Mfg Co — Boston Mass

Proprietory Article (Yes, no)	Wanted by what date
Yes	9/1/10

Approved [illegible] U. S. Navy.

The following material has been received from Ferguson Mfg Co for the S. Eng Dept.

Quantity		Description.
No	4	Klinger Reflex Glasses, complete with spare glasses

If there is a criticism of the material mark a cross here....... and report on back of this slip.

John Smith P.A. Pay U. S. N.

General Storekeeper.

FORM 6.

THE EXECUTIVE OFFICER'S OFFICE.

This is a system designed to afford a convenient classification:

1. Of the ship's station bills and office correspondence.

2. Of all records of the enlisted personnel.

3. To make the complete status of the office business apparent at a glance to the executive officer's temporary successor, and to make such information independent of any yeoman.

1. Correspondence: Station Bills.—Regulations Internal Discipline.

File all such in a numerical file with card index, precisely similar to that described for the captain's office. Among the characteristic papers that will find their way to such a file are smooth copies of the following:

Fire Bill.	Man Overboard.
Collision Bill.	Load and Draft.
General Quarter Bill.	Letters Transferred Men.
Rescue Party.	Quarterly Marks.
Messing Bill.	Rewards Offered.
Berthing Bill.	Mess Statements.
Abandon Ship.	Weekly Allowance Cleaning Gear.
Miscellaneous Orders.	Transportation Requests.
Directory of Office.	
Boat Bill.	

2. Enlistment Records.

File the old-style enlistment records flat on edge in legal size folders, assigning one record to each folder. File the folders behind *alphabetical guides.*

File all telegrams, requests or miscellaneous information of any kind relating to any enlisted man in the folder with his record. The production of the record then brings with it every paper of interest in connection with the person concerned.

One man of a ship's company preferred a request for leave for the purpose of visiting his parents: natural request, except that

on file with his record was found a telegram, dated a year before, announcing the death of his mother.

The new type (book) enlistment records may be filed in the same folders as the old type; or they may be filed *without folders* behind *check sorter* guides, in a separate cabinet which we have illustrated.

Such filing is not recommended, however, as it prevents the preservation in convenient form of the individual literature before referred to.

Alphabetical List of Crew.

MUSTER ROLL—CONDUCT BOOK.

An ALPHABETICAL LIST *of the crew, irrespective of rating,* is required; for use in connection with the preparation of the quarterly *muster roll,* and for the preparation of visiting lists in general.

For this file use cards 5 x 8, as illustrated, filed behind *alphabetical guides,* about 250 to the set for a crew of 900 men.

As a further convenience, use cards of *different colors,* the color indicating the *branch* of the person concerned in accordance with the following table:

Seaman Branch	Salmon.
Artificer Branch	White.
Engine-room Force	Blue.
Special Branch	Buff.
Commissary Branch	Green.
Messmen Branch	Chocolate or fawn.

Complement and Muster Roll of Crew.

This file is designed to facilitate the preparation of the *weekly report of vacancies;* also for conducting at any time a *general muster of crew.*

It is essentially a file of guides; single-cut and half-cut guides being used, varied in color as convenience suggests.

Name Rate

McVey, Thomas Albert
(Full name, surname to the left)

Enlisted Oct. 21, 1908,

at Buffalo N.Y., to serve

{four years from date.
{~~during minority, until~~},

Previous naval service, about 4 years.

Holds C. S. C. No. 24648

Holds G. C. medals, None.
(Number)

Trade, Piano Polisher

*Citizenship, U.S.

Place of birth, Binghampton, N.Y.

Date, May 28, 1882

Home address: City, #302 Cherry St. Buffalo State N.Y.

Name and address of next of kin, (Mother) Mrs. Catherine McVey.
same address.

Transferred
~~Deserted~~
Di

March 31 .... 19 10 ...... U. S. S. Lawson ....

Discharged at .... (To what vessel or disposition.)

with .... on account of ....

.... discharge, this ...... day of .... 19......

Furnished transportation and subsistence to ....

Gunnery Record, ... Gun Pointer .... Class .... Total cost, $........

(Insert H. I. or S. class and date.)

Is recommended for honorable discharge........? Good conduct medal........? Reenlistment........?

Rating Best qualified for .... Health ....

Pay at date of discharge:

Pay per month (pay table),	$......	......
Additional for continuous service,	......	......
Additional for G. C. medals, Dated .... (Year only.)	......	......
Additional for certificate of graduation,	......	......
Additional for qualified C. P. O.,	......	......
Additional for U. S. citizen reenlisting,	......	......
Additional ten per cent,	......	......
Additional for detail as,	......	......
Total pay per month,	......	......

State of account at date of ....

FORM 9.—ALPHABETICAL CREW, BACK.

The sequence of guides follows that of Bureau of Navigation form 25, weekly report of vacancies.

Begin thus:

No. of guide.	Kind.	Color.	Label.
1.	Single cut	Red	Seaman Branch (150) the number indicating the total of the seaman branch allowed by the complement sheet.
2.	Single cut	Buff	Chief-Master-at-Arms (1) number indicating as before.
3.	Half-cut	Blue	Master-at-Arms 1C (4).
4.	Half-cut	Blue	Master-at-Arms 2C (4).
5.			
6.			

Continue thus: Chief petty officer, *single cut;* all other petty officers and men, *half cut.* Alternate color as required.

Behind each rating guide file cards showing the names of the holders of such rates, each on a separate card. Thus: Behind chief-master-at-arms 1 should be found *one card* bearing a name. Should there be a vacancy, there would be no card, and the fact of the vacancy would be apparent. Should there be one in excess, two cards would be found.

So long as the number stamped on the guide is correct, the number of cards filed is absolutely a measure of the state of the complement.

REPEATED CAUTION.—*Stamp guides in rubber type—both sides of every tab to permit of reversal.*

Labels.

These are most readily printed in the ship's press, on the reverse side of the many different color cards provided.

The most convenient way is to make a tabular list of all labels required of the same size; have them set up in a single chase spaced as required after cutting; and printing in sheets on as many different colored cards as may be at hand.

When labels thus printed are cut up, every label is at hand in every color, and any desired color combination is instantly effected.

Special Details.

The special form of card illustrated is filed behind ½ cut guides, showing *detail*. Thus sample labels would include:

Crew Messmen.
Captain Head.
Captain Hold.
Messengers.
Orderlies.
Signalmen.
Gun-deck Cleaners.
Berth-deck Cleaners.
Splinter-deck Cleaners.
Storeroom Keepers.
Washroom Keepers.
Lamplighter.
Jack-of-Dust.
Mail Clerk.
Tailor.
Steam Launches' Crews.
Printer.

Every man on ship subject to detail has a detail card prepared. When not actually on detail, file his card alphabetically behind a single-cut guide labeled *men not on detail*.

After the expiration of a reasonable period the detail cards show a variety of useful information.

Every file of enlisted personnel should begin with a *marker* showing the *date to which the file is corrected*, and such correction should be made twice weekly. Without this precaution the files soon fall hopelessly behind.

Record of Leave.

A file of 5 x 8 cards, as illustrated, filed behind *alphabetical guides*.

Provide a card for every man in the ship's company.

When the man is not on leave, file his card alphabetically behind a leading guide labeled *men not on leave*, and when he leaves the ship remove the card from the old file, and place it in the file beginning *men on leave*.

After the expiration of a reasonable period the card shows just how much leave the man has had. It becomes impossible for him to come to the "mast" and say "I haven't had leave for ——."

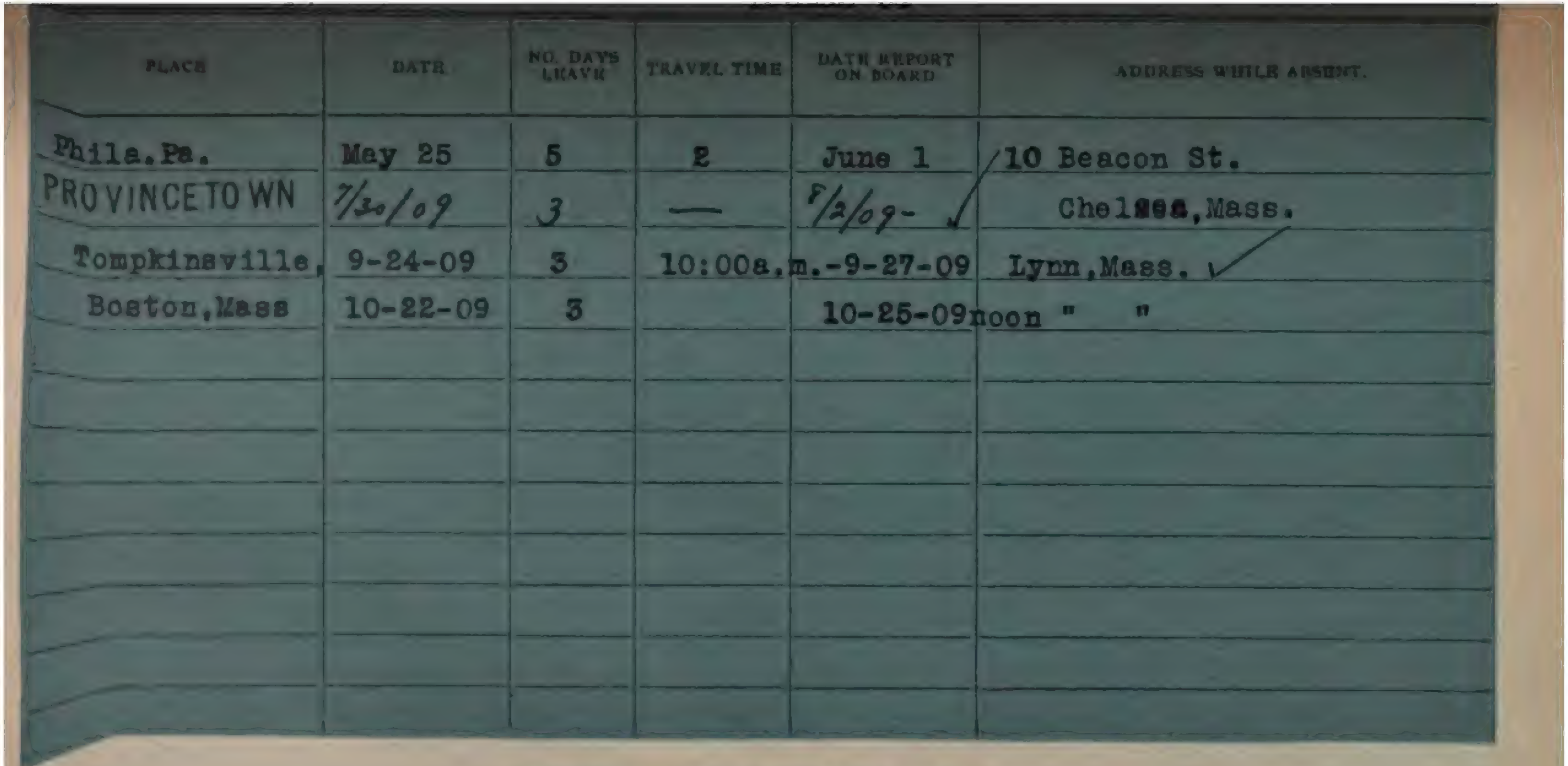
In the event of the vessel sailing unexpectedly it is but a matter of minutes to run through the leave file and notify all absent men of projected movements, for which use a *postal-penalty, stamped*, is all that is required.

NAME Anderson,A.C.

RATE F2C

DETAILS

DETAILED AS	DATE DETAIL	DATE RELIEF	MANNER OF PERFORMING DUTY—WHY RELIEVED
Messman	Feb.4	Feb 28	Satisfactory;Change in detail.
Eng 1st St.	June 17	Mch.5	Satisfactory in work,Unreliable
Relief St.Launch Engineer	Mch.26	May-15-	" " " " Chronic liberty breaker
Wash Room keeper	May-16-10	JuneJu0-10	Satisfactory change in details.
Messman	June-11-10	July-1-10	" " " "
Foreman 2nd Steamer	July 2-10	August-1-10	" " " "



PLACE	DATE	NO. DAYS LEAVE	TRAVEL TIME	DATE REPORT ON BOARD	ADDRESS WHILE ABSENT.
Phila. Pa.	May 25	5	2	June 1	10 Beacon St.
PROVINCETOWN	7/30/09	3	—	8/2/09 -	Chelsea, Mass.
Tompkinsville,	9-24-09	3	10:00a.m.	-9-27-09	Lynn, Mass.
Boston, Mass	10-22-09	3		10-25-09 noon	" "

FORM 11.—RECORD OF LEAVE, FRONT AND BACK.

Previous Occupations.

An index of this kind is a most valuable aid to eliminate misfits among the crew, one of the most frequent sources of unhappiness, originating from a too literal acceptation of the *trade* given upon enlistment. What really is wanted is a record of every occupation at which the man has previously earned money. Recruits do not understand the wide range of occupations found on board ship.

Having such a file, the executive officer, when he wishes a striker for the barber, finds one under *barber;* or, if he wants a moving picture operator, can find one; or, if he wants an undertaker, may even find that.

File these cards, size 3 x 5, behind special third-cut guides labeled by *trades*.

Individual Liberty Card—Conduct Record.

5 x 8 cards, printed both faces.

No record of liberty is kept except for the men of second, third or fourth class; but the place, date and time of every liberty extended classed men is entered on card. Thus, in the absence of the executive officer or other person controlling the liberty, John Brown, seaman, cannot appear with a telegram, and perhaps represent to the acting executive officer "I'm third class and haven't been ashore for a month." The executive officer consults the file, and verifies his statement at once.

The reverse side of every liberty card contains the record of conduct. This record is of inestimable value in considering special requests of any character. A man might be technically first-class without being entitled to a special privilege, such as being one of a limited number to attend a minstrel show.

If the crew be divided into two liberty parts, cards of three colors will be required:

Starboard Watch .... Salmon.
Port Watch .... White.
General Parts .... Blue.

If the crew be divided into four parts, cards of five colors are required.

The cards of each part are filed behind *alphabetical guides*.

The conduct record of each man is entered on the back o card.

FOR THE CAPTAIN'S OFFICE.

Furniture.

(Outside width 38 5/16 inches.)

3 Two-drawer legal file units, 24 in. deep, oak, antique finish, without locks. Each $17.00 ....Total, $51.00
1 Six-tray card index unit, 3 x 5 cards, 16 in. deep, oak, antique finish, without locks. Each $20.00 ....Total, $20.00
1 Cornice unit, oak antique, 16 in. deep ....Each, $3.25
1 Low-leg base unit, 24 in. deep, oak antique ....Each, $3.25

CAUTION.—In ordering furniture specify outside dimensions of cabinets, 38 5-16 inches.

Stationery.

1000 Folders, *manila*, legal size, standard grade, medium weight, half cut, numbered consecutively 1 to 750 and 250 blank $11.00
100 Guides, metal tip, 1-5 cut, heavy weight, numbered 1 to 100 by tens $9.00
25 Same, alphabetical, 25 to set............................... $2.50
100 Numerical guides, for 3 x 5 cards, 1-5 cut, 1 to 1000 by tens, celluloided, *salmon* $2.50
1 Set alphabetical guides, for 3 x 5 cards, 250 to set, celluloided, *salmon* $4.50
4000 Cards, 3 x 5, *white*, commercial No. 1 grade, light weight, correspondence ruling $8.00

GENERAL STOREKEEPING SYSTEM COMPLETE.

Furniture.

(All units 38 5/16 inches wide.)

4 Two-drawer legal file units, 24 in. deep, oak antique finish, without locks. Each $17.00.................................. $68.00
3 Two-drawer correspondence file units with intermediate storage drawer, 24 in. deep, oak antique finish, without locks. Each $16.00 .... $48.00
1 Four-drawer card index unit, for 5 x 8 cards, 16 in. oak antique finish, without locks. Each $13.00......................... $13.00
3 Six-tray card index units, for 3 x 5 cards, oak antique finish, without locks, 16 in. deep. Each $11.00.................... $33.00
2 Cornice units, antique oak, 16 in. deep. Each $3.25.............. $6.50
2 Low-leg base units, 24 in. deep, antique finish oak. Each $3.25.. $6.50

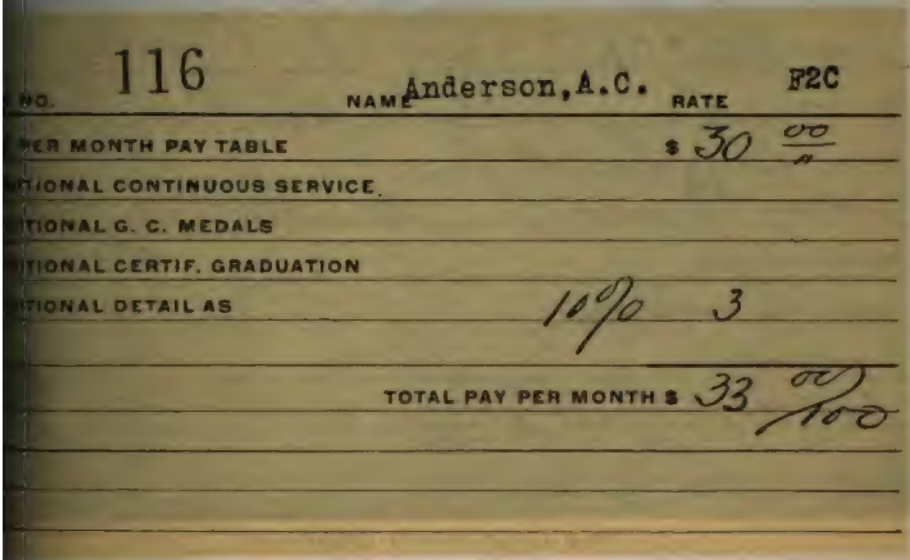
	MERITORIOUS CONDUCT WORTHY OF SPECIAL MENTION. (Note date.) OFFENSES OR CAUSE OF DISRATING (Note date.)	PUNISHMENTS (Note the date of issue of appointments and change in rating.)
1	6-8-09. Overleave 62 hrs.	4th class
2	-7-09. Overleave 102 "	S.C.M. Sol. conf. [illegible] hd. lose $37.40
3	4-18-09 " 23½ hrs.	Reduced to 4th class.
4	5-30-09 " 86 "	Dec. C. Lose pay amty to $17.60.
5	8-12-09 " 11 days 10 hrs	S.C.M. Sol. conf. [illegible] 10 d. & to lose $66.00
6	1-20-10 " 89 hrs.	Dk. Cl. Lose pay amty to $22.00
7	[illegible] " 137 "	S.C.M. Sol. conf. 10 days lose $45.00
8		
9		
10		
11		
12		

Reverse Side above card

In each liberty part drawer single-cut guides or portable colored steel markers divide the whole into conduct classes: *Special, first, second, third, fourth and restricted.*

The liberty list is prepared from the alphabetical part list.

Pay Numbers.



NO. 116 NAME Anderson,A.C. RATE F2C

ER MONTH PAY TABLE $ 30 00/..

TIONAL CONTINUOUS SERVICE

TIONAL G. C. MEDALS

TIONAL CERTIF. GRADUATION

TIONAL DETAIL AS 10% 3

TOTAL PAY PER MONTH $ 33 00/100

FORM 13.—PAY NUMBERS.

3 x 5 cards, as illustrated in duplicate for each man, one set filed consecutively behind numerical guides, the other set alphabetically behind alphabetical guides.

Home Town.

3 x 5 cards, with the name and rate filed alphabetically behind city guides, the nearest large coast city or port being used as the label. Port guides filed consecutively from north to south.

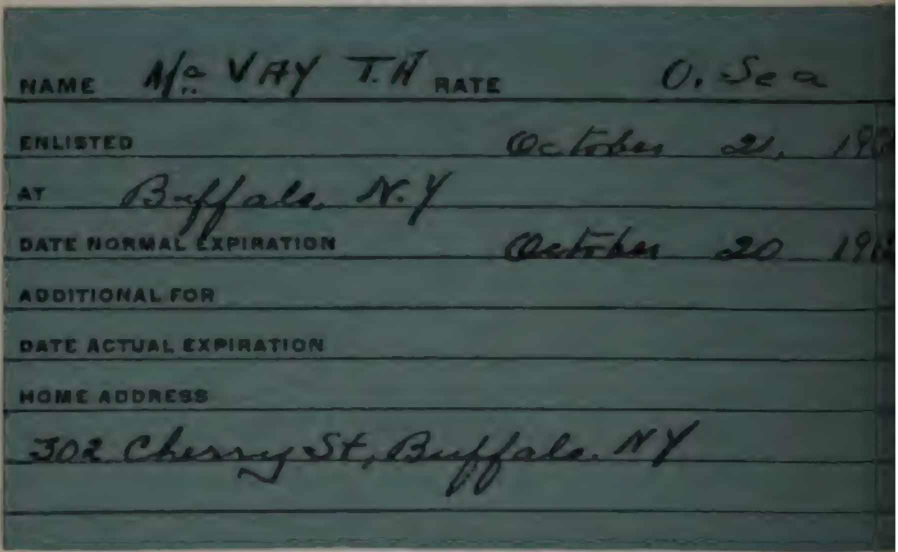
Expiration of Acting Appointment.

3 x 5 cards, filed behind chronological guides, heavy typewriter paper will do.

Continuous Service Certificates.

Are filed alphabetically behind 5 x 8 guides in 5 x 8 cabinet drawers.

Expiration of Enlistment.



NAME Mc VAY T.H RATE O. Sea

ENLISTED October 21, 19

AT Buffalo N.Y

DATE NORMAL EXPIRATION October 20 19

ADDITIONAL FOR

DATE ACTUAL EXPIRATION

HOME ADDRESS

302 Cherry St, Buffalo N.Y

FORM 14.—EXPIRATION ENLISTMENT.

3 x 5 cards, as illustrated, filed behind chronological guides.

Itemized List of Equipment.

Itemized lists of the furniture and equipment necessary to install filing systems complete, as herein described, in a first-class vessel having a complement of one thousand men, are here appended.

They aggregate one thousand dollars evenly apportioned between the Bureau of Construction, which furnishes the furniture or cabinets proper, and the Bureau of Supplies and Accounts, which furnishes stationery.

Should a miscellaneous assortment of guides, folders and cards be included in the annual stationery contract of that Bureau, the total cost per ship would be reduced considerably.

FOR THE CAPTAIN'S OFFICE.

Furniture.

(Outside width 38 5/16 inches.)

3 Two-drawer legal file units, 24 in. deep, oak, antique finish, without locks. Each $17.00 .... Total, $51.00
1 Six-tray card index unit, 3 x 5 cards, 16 in. deep, oak, antique finish, without locks. Each $20.00 .... Total, $20.00
1 Cornice unit, oak antique, 16 in. deep .... Each, $3.25
1 Low-leg base unit, 24 in. deep, oak antique .... Each, $3.25

CAUTION.—In ordering furniture specify outside dimensions of cabinets, 38 5-16 inches.

Stationery.

1000 Folders, *manila*, legal size, standard grade, medium weight, half cut, numbered consecutively 1 to 750 and 250 blank $11.00
100 Guides, metal tip, 1-5 cut, heavy weight, numbered 1 to 100 by tens $9.00
25 Same, alphabetical, 25 to set $2.50
100 Numerical guides, for 3 x 5 cards, 1-5 cut, 1 to 1000 by tens, celluloided, *salmon* $2.50
1 Set alphabetical guides, for 3 x 5 cards, 250 to set, celluloided, *salmon* $4.50
4000 Cards, 3 x 5, *white*, commercial No. 1 grade, light weight, correspondence ruling $8.00

GENERAL STOREKEEPING SYSTEM COMPLETE.

Furniture.

(All units 38 5/16 inches wide.)

4 Two-drawer legal file units, 24 in. deep, oak antique finish, without locks. Each $17.00 .... $68.00
3 Two-drawer correspondence file units with intermediate storage drawer, 24 in. deep, oak antique finish, without locks. Each $16.00 .... $48.00
1 Four-drawer card index unit, for 5 x 8 cards, 16 in. oak antique finish, without locks. Each $13.00 .... $13.00
3 Six-tray card index units, for 3 x 5 cards, oak antique finish, without locks, 16 in. deep. Each $11.00 .... $33.00
2 Cornice units, antique oak, 16 in. deep. Each $3.25 .... $6.50
2 Low-leg base units, 24 in. deep, antique finish oak. Each $3.25 .. $6.50

Stationery.

Quantity.		
5000	Cards, 3 x 5, *white*, printed both sides as per form 7, commercial No. 1 grade, light weight. No punch	$10.00
2000	Cards, 3 x 5, *salmon*, printed both sides as per form 8, commercial No. 1 grade, light weight. No punch	$6.00
6	Sets, Guides, 3 x 5, commercial one-fifth cut, numbered consecutively from 1 to 65, celluloided, *salmon*. No punch	$9.00
20	Sets, Guides, 3 x 5, alphabetical, 25 to set, celluloided, tabbed, 12 tabs to width, *buff*	$15.00
3000	Card Ledger, cards, correspondence size printed on both sides as per form 2, commercial No. 1 grade	$45.00
2000	Cards, 5 x 8, printed both sides, as per form 3, *white*, commercial No. 1 grade, light weight	$16.00
1000	Cards, 5 x 8, printed on one side as per form 5, *white*, commercial No. 1 grade, light weight	$8.00
1000	Cards, 5 x 8, printed on both sides as per form 16, *salmon*, commercial No. 1 grade, light weight	$10.00
50	Guides, metal tip, single cut, legal size, heavy weight	$5.50
75	Guides, metal tip, third cut, legal size, heavy weight	$8.00
75	Guides, metal tip, fifth cut, legal size, heavy weight	$8.00
50	Guides, metal tip, fifth cut, numbered from 1 to 500 by tens, legal size, heavy weight	$6.00
65	Guides, metal tip, fifth cut, numbered consecutively from 1 to 65, correspondence size, heavy weight	$7.00
8	Sets, Guides, pressboard, heavy alphabetical, 25 to set, correspondence size	$15.00
200	Folders, legal size, half cut, *yellow*, No. 1 grade	$6.00
200	Same, *red*	$6.00
200	Same, *green*	$6.00
200	Same, *manila plain*	$6.00
500	Folders, *manila*, legal size, half cut, numbered consecutively 1 to 400 and 100 blank	$5.00

EXECUTIVE OFFICER'S OFFICE.

Furniture.

4	Two-drawer legal file units, 24 in. deep, antique finish, without locks. Each $17.00	Total, $68.00
8	Four-tray card index units for 5 x 8 cards, antique finish, 16 in. deep, without locks. Each $14.00	Total, $112.00
1	Six-tray check file unit, antique finish, 16 in. deep, without lock. Each $20.00	Total, $20.00

3	Six-tray card index units for 3 x 5 cards, 16 in. deep, antique finish, without locks. Each $11.00..............Total,	$33.00
2	Cornice units, antique oak, 16 in. deep. Each $3.25..........Total,	$6.50
2	Low-leg base units, 24 in. deep, antique oak. Tach $3.50....Total,	$7.00

Stationery.

(All estimates for material are liberal.)

Quantity.		
1000	Cards, 5 x 8, *salmon*, light weight, commercial No. 1 grade, Special Ruling U. S. Navy Form No. 9................	$8.00
500	Same, *white*	$4.00
1000	Same, *blue*	$8.00
500	Same, *buff*	$4.00
250	Same, *green*	$3.00
250	Same, *fawn*	$3.00
1	Set alphabetical guides, for 5 x 8 cards, 250 to set, celluloided, *salmon*	$3.00

Complement and Muster Roll.

Quantity.		
200	Guides, single cut, blank for 5 x 8 cards, *buff*................	$12.00
200	Same, *blue*	$12.00
200	Same, *salmon*	$12.00
200	Guides, half cut, blank for 5 x 8 cards, *buff*..................	$12.00
200	Same, *blue*	$12.00
200	Same, *salmon*	$12.00
1500	Cards, 5 x 8, *white*, commercial No. 1 grade correspondence, ruling, light weight................................	$12.00

Special Details.

Quantity.		
2000	Cards, 5 x 8, *salmon*, commercial No. 1 grade, light weight, Special Ruling U. S. Navy Form 10. Per M..........	$16.00
100	Guides, blank, for 5 x 8 cards, half cut, *buff*..................	$6.00
1	Set alphabetical guides, for 5 x 8 cards, 250 to set, celluloided..	$7.00
10	Guides, single cut, blank, for 5 x 8 cards, *salmon*.............	$1.00

Record of Leave.

Quantity.		
2000	Cards, 5 x 8, Special Ruling U. S. Navy Form 11, commercial No. 1 grade, light weight, *blue*......................	$16.00
1	Set alphabetical guides, for 5 x 8 cards, 125 to set, celluloided, *salmon*	$3.50
1	Set same, *buff*..	$3.50

Individual Liberty Card—Conduct Record.

Quantity.		
1000	Cards, 5 x 8, ruled as per Special Form U. S. Navy No. 12, commercial No. 1 grade, light weight, *salmon*	$8.00
1000	Same, *buff*	$8.00
1000	Same, *blue*	$8.00
	If four liberty parts:	
1000	Same, *white*	$8.00
1000	Same, *fawn*	$8.00
4	Sets alphabetical guides, for 5 x 8 cards, 125 to set, celluloided, *buff*	$28.00
5	Sets alphabetical guides, for 5 x 8 cards, 25 to set, celluloided, *buff*	$5.00
5	Sets same, *salmon*	$5.00
5	Sets same, *blue*	$5.00

Pay Numbers.

Quantity.		
5000	Cards, 3 x 5, Special Ruling U. S. Navy Form No. 13, commercial No. 1 grade, light weight, *buff*	$15.00
1	Set alphabetical guides, for 3 x 5 cards, 250 to set, celluloided, *salmon*	$4.50
1	Set numerical guides, for 3 x 5 cards, 1-5 cut, celluloided, 1 to 2000 by tens, 200 cards, *buff*	$4.00

Expiration of Enlistment.

Quantity.		
2000	Cards, 3 x 5, Special U. S. Navy Form No. 14, commercial No. 1 grade, light weight, *buff*. Per M	$5.00
5	Sets monthly guides, for 3 x 5 cards, celluloided, *salmon*. Each	$1.00
1	Set yearly guides, for 3 x 5 cards, celluloided, 1910 to 1917, *blue*	$ .25

Expiration Acting Appointment.

Quantity.		
1000	Cards, 3 x 5, commercial No. 1 grade, blank, correspondence ruling, *white*	$3.00
2	Sets monthly guides, for 3 x 5 cards, celluloided, *salmon*	$ .50
1	Set yearly guides, for 3 x 5 cards, celluloided, 1910 to 1917, *blue*	$ .25

Home Towns.

Quantity.		
1000	Cards, 3 x 5, commercial No. 1 grade, blank, correspondence ruling, *white*	$3.00
100	Guides, blank 1-5 cut, for 3 x 5 cards, *salmon*	$2.00

Continuous Service Certificates.

1 Set alphabetical guides, for 5 x 8 cards, 55 to set, celluloided, *salmon* $1.50

Miscellaneous Stationery.

For use under special conditions which cannot be comprehended in a general schedule.

3000 Cards, 5 x 8, blank, commercial No. 1 grade, correspondence ruled, in 6 assorted colors, 500 of each.......... $20.00

3000 Same, size 3 x 5 .... $6.00

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ON THE RELATIONS BETWEEN THE U. S. NAVAL WAR COLLEGE AND THE LINE OFFICERS OF THE U. S. NAVY.

By REAR-ADMIRAL S. B. LUCE, U. S. Navy (Retired).

NOTE.—The annual Naval and Military Conference was opened at the Naval War College, Newport, R. I., on June 2d, by the Secretary of the Navy, the Hon. G. v. L. Meyer.

Mr. Meyer's address was a clear statement of his policy for promoting naval efficiency and, at the same time, insuring economy.

The most gratifying parts of his remarks were those devoted to the War College and his interest in its future success. He gave assurance that it was his intention to see that, in future, officers would be detailed for War College duty for longer periods than four months. As this was the sole plea of Rear-Admiral Luce, who followed Secretary Meyer, his paper seemed uncalled for. But as it was then too late to recast his argument, the paper was read as originally written.—THE EDITOR.

Mr. Secretary, Admiral Rodgers, and members of the Naval and Military Conference of 1911.

GENTLEMEN: In extending a few words of welcome I avail myself of the opportunity to explain to those who are here for the first time the relations between the college and the great body of the navy; but more particularly the relations between this college and the line officers of the navy. In doing so I disclaim most emphatically any intention of reflecting in any way upon anyone in office. My remarks are entirely impersonal.

This college was established by the Navy Department to supply certain urgent demands. It has had, and has now, many warm, and I may say enthusiastic friends; but the great majority of line officers have, so far, failed to appreciate its value as an educational institution.

The Civil War brought out the fact that our system of naval administration was organized on the theory of perpetual peace.

It was to remedy this defect, as far as practicable, that the Naval War College was erected. It was designed to produce, by a process of self-education, a body of officers from which to select commissioners (to use a very old term), "commissioners for executing the office of the constitutional commander-in-chief of the Navy."

But the impossibility of the United States ever being at war discouraged the idea of having such a body of officers. Then came the Spanish War. We soon learned to our cost that we had failed to profit by one of the most important lessons of the Civil War; viz., the necessity for the re-adjustment of our system of naval administration. After the very impressive lesson, in this respect, of the Spanish War, a feeble attempt was made to remedy this defect. The remedy was to create a body of officers who had prepared themselves by study at this College for that express purpose. But the effort lacked support, and to-day, after 26 years, there is not a single officer with War College record connected with the administration of naval affairs.

Not that there is any special virtue in a mortar-and-stone building—in the War College itself. The virtue lies in the group of earnest officers who avail themselves of the opportunity it (the college) affords for the study of their profession. It is in the environment, the atmosphere, the community of interests, the association of officers of congenial tastes and pursuits, all tending to one and the same end, that the advantage lies. When an association of officer-students devote their energies to the same lines of investigation, the same course of reading, study and reflection, they derive great benefit from the constant interchange of views. This stimulates originality of thought. The opinions on professional subjects, of officers who have, in this manner, given conscientious study to the various problems of naval science, are of great value. Such opinions may not always be conclusive, but they are always entitled to respect. Not so with those who, however brilliant, have not enjoyed the advantage of that kind of mental training. Now we have here, in the staff of this college, just such an association of officers; officers who are pursuing the same general course of study and who, intimately associated as they are day by day throughout the year, are constantly interchanging views relative to their respective lines of investigation.

Those officers compose the college staff, as I have said, and

their studies are confined to the art of war; it may be *Strategy, Tactics, Logistics, History or International Law.* Those are the officers who qualify themselves for the higher duties of flag officers. But when one compares the number of such officers (at present only about four or five) with the entire body of line officers, from captains to lieutenants, inclusive, some 760 in number, it will be seen how very few there are who are studying their profession—the art of war.

Again, when some years ago a number of officers sought in the Smithsonian Institution the means of gratifying a laudable desire for scientific research, it was assumed that there was a demand for higher professional education. To supply these two demands —the placing of the naval administration on a war footing, and providing higher professional education—this War College was established. But the line officers of the navy have (with the exceptions noted) failed to appreciate it. I shall endeavor to establish the truth of this proposition. It is important that the naval officers of this conference should understand the position of the college in its relations to their own corps. The time is limited to the expiration of the last conference—that of 1910, for changes have taken place since then.

It may be said, in general terms, that this college was established for the express purpose of enabling officers, by self-effort, to build upon the foundation laid at the Naval Academy; and, by successive steps, reach the highest plane of development as militant seamen and statesmen; and thus to qualify themselves for the most responsible duties that can devolve upon a naval officer, viz., as *aides* to the Secretary of the Navy and as the commander-in-chief of a fleet. Experience has shown that this was no idle dream. The great works on "Sea Power," covering over two hundred years of naval history, and containing lessons in statesmanship, strategy and tactics, together with the "Naval War Code," which found ready acceptance by all the maritime powers, prove, were other proofs wanting, of what this college is capable if properly appreciated and rightly used.

It may be mentioned that the greatly lamented Rear-Admiral Sperry first came to this college as a member of the Summer Conference. His keen intellect was quick to perceive the great advantages it offered to the naval student. He subsequently came here for the avowed purpose of preparing himself for wider fields

of study. He thus fitted himself for the honorable and responsible part he took as a delegate, first of the Geneva Convention, in 1906, and later as a delegate of the second Hague Conference in 1907,* and for the duties of commander-in-chief of a fleet. After hauling down his flag, he was unstinted in his acknowledgments of all he owed the War College for his success. Rear-Admiral Mahan's services at this college won for him world-wide fame. May he live many years to enjoy it. But when, in the course of nature, he leaves this world, upon whom shall his mantle descend? Rear-Admiral Stockton, now President of the George Washington University, and Rear-Admiral Chadwick have been mentioned in connection with this college in former papers. The great debt the college owes to Rear-Admiral H. C. Taylor has been gratefully acknowledged already.

But we are told the naval officer to-day is a "fighting engineer," and this mockery of truth has been accepted by the profession. On this pernicious theory, naval education now concerns itself with the engine-room and the battery alone. There it stops. Naval education now concerns itself with the training of arms and legs only. It takes no thought of the brains. It furnishes the means of locomotion and of aggression, but ignores the means of intelligent direction of those forces. That is the attitude of the navy to-day in respect to higher education. Let there be no false issues. It is conceded that every naval officer must be something of a marine engineer; and the better the engineer he is the better for the navy. The point is: Why should his education stop there? That it does stop there explains the status of this college. In the twenty-six years of its existence it has never had a class of officer-students. It has had presidents, and faculty, or officers forming a college staff, but no students. As far back as the administration of 1888 the course of the Summer Conference was cut down very materially on the ground of the "great scarcity of officers," and this before we had a battleship in commission. Thus:

NAVY DEPARTMENT, WASHINGTON, August, 1, 1888.

Capt. A. T. Mahan, U. S. Navy, Naval War College, Newport, R. I.

SIR: In view of the *great scarcity of officers* for active duty, the Department requests that the course of the War College be limited to three

*See U. S. Navy War College, Proceedings Naval Institute, Vol. 36, No. 2, page 586.

months, beginning August 6. The order will be issued with such limitations. In view of the fact that during the last year's course less than an average of two lectures per day were delivered, excluding Saturday and Sunday, the Department feels that the interest attached to the course will not be impaired by condensing the course into a shorter period.

Very respectfully,

(Signed) W. C. WHITNEY,
Secretary of the Navy.

This was the time when Rear-Admiral Mahan was preparing his lectures on "Sea Power." The Summer Conferences of four months' duration (practically only 78 days) are the nearest approach to a class of officer-students of the art of war the college has ever reached until within the past year.

For several years of the more recent past, efforts have been renewed to get a class of *five* officers sent to the college for a term of a year or sixteen months, but without success.

All the great masters of the art of war who have written upon the subject, dwell upon the importance of a knowledge of strategy, and the amount of study and reflection required to master it. We give 78 days to it and a vacant chair of Naval History.*

Fifteen years ago this was seen to be trifling with a subject admittedly of the highest importance. For that reason the following order was issued:

SPECIAL CIRCULAR NO. 20.

NAVY DEPARTMENT, WASHINGTON, February 18, 1895.

1. The Session of the Naval War College and Torpedo School for 1895 will commence on the first day of June next, and will terminate on the fifteenth day of October.

2. It is the intention of the Department to detail a class of about twenty-five officers (fifteen of and above the grade of lieutenant and ten below that grade) for attendance during the session. From this class it is proposed to select five officers to remain after the session to continue the general work through the winter and prepare for the next session. These five officers will be chosen for their aptitude in the work, and their attainment in International Law, Strategy and Tactics.

. . . .

H. A. HERBERT,
Secretary.

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* The course is nominally four months. But throwing out the time given to International Law, lectures on various subjects, holidays, etc., but seventy-eight days are left for the Art of War!

own that any such invitation was ever extended to apply for the School of War. On the contrary, it is a f common report that such applications have been dis-d. And then we have a seaman gunner's class, electrical yeoman's classes, class for machinist's mates, artificers' musician's classes and classes for commissary stewards, nd bakers. All very proper. But in our whole scheme education the principal branch—the branch to which the es its existence—the School of War, has been strangely Why?

re being constantly reminded that a battleship is a mobile compacted of machinery for motive power and for the of the guns. Hence the necessity for special schools of engineering and naval gunnery. This is as it should be. itary value of good marine engineering cannot be over-d, and straight shooting means success in battle. The to be congratulated on the establishment of these schools ers and on the gratifying results already secured. But p there?

ew school of marine engineers was established in order ılate general interest in steam and electrical engineering throughout the navy, and to provide a method for secur-ıpetent designing engineers. The War College was es-d in order to stimulate general interest in the art of war provide competent naval strategists, the central power, the as already stated, to insure unity of purpose among all ous members of the military body whose sphere of action e high seas. It is not simply a question of intellectual but one of centralization.

former school achieved immediate success; the latter, after er of a century, is still hoping for it. In a literal sense res as much brains to master the science on which the engineer's art depends as it does in any other branch of al service. The same is true of the science of ordnance gunner's art. The establishment of the new schools for sts has unquestionably done much, and will do still more, ote the efficiency of the naval service, the end to which aim. We thus secure the highest type of the "fighting r."

It will be seen from this order that it was the intention of the Department that comparatively young officers who had shown an aptitude for the cultivation of the higher professional branches should remain at the college for *study;* not to hear lectures, which are very well in their way—but to study. And of all the junior officers in the service it was a modest assumption that five such officers might be found. That was before the Spanish War, when the officers could have been found, had there been anyone in the Navy Department of that day to see that the orders of the Secretary of the Navy were carried out. But there was no one.

To these applications the invariable answer has been, as already stated, that there were "no officers to spare." Considering the educational values of the various duties to which officers may be assigned, the navy register reveals one very interesting fact. Officers are detailed for duty at all the shore stations, to ships on harbor service, to "special service," such as the Fish Commission, obsolete gunboats in the Philippines, and so forth, so that when we come to the War College there are "no officers to spare." This is proof *not* of how low an estimate is placed on higher professional education, but that it has no standing at all. After an experience of twenty-three years' failure to get a class of five officer-students assigned to the War College, its friends were forced to the conclusion that the answer that there were "no officers to spare" meant that there were *no officers to spare for the War College.* This belief was confirmed when 20 officers accepted the official notification and were on their own application assigned to the new School of Steam Engineering. Over two hundred officers applied for admission to the new school; but up to the time of the Conference of 1910 not one officer was invited to apply for the War College. The class of officers at the School of Steam Engineering is limited to twenty. The War College asked for five and was refused. Ten officer-students are admitted each year to the School of Marine Engineering; not one to the School of War. The course at the School of Steam Engineering covers two years. There is no course at all at the School of War. We learn further that there has been established a class of officers for special instruction in ordnance. But there is no class under special instruction in naval tactics and naval strategy. Those branches are simply ignored by the profession.

Applications for the School of Engineering were invited. It

is not known that any such invitation was ever extended to officers to apply for the School of War. On the contrary, it is a matter of common report that such applications have been discouraged. And then we have a seaman gunner's class, electrical classes, yeoman's classes, class for machinist's mates, artificers' classes, musician's classes and classes for commissary stewards, cooks and bakers. All very proper. But in our whole scheme of naval education the principal branch—the branch to which the navy owes its existence—the School of War, has been strangely omitted. Why?

We are being constantly reminded that a battleship is a mobile fortress compacted of machinery for motive power and for the working of the guns. Hence the necessity for special schools of marine engineering and naval gunnery. This is as it should be. The military value of good marine engineering cannot be overestimated, and straight shooting means success in battle. The navy is to be congratulated on the establishment of these schools for officers and on the gratifying results already secured. But why stop there?

The new school of marine engineers was established in order to stimulate general interest in steam and electrical engineering matters throughout the navy, and to provide a method for securing competent designing engineers. The War College was established in order to stimulate general interest in the art of war and to provide competent naval strategists, the central power, the brains, as already stated, to insure unity of purpose among all the various members of the military body whose sphere of action is on the high seas. It is not simply a question of intellectual powers but one of centralization.

The former school achieved immediate success; the latter, after a quarter of a century, is still hoping for it. In a literal sense it requires as much brains to master the science on which the marine engineer's art depends as it does in any other branch of the naval service. The same is true of the science of ordnance and the gunner's art. The establishment of the new schools for specialists has unquestionably done much, and will do still more, to promote the efficiency of the naval service, the end to which we all aim. We thus secure the highest type of the "fighting engineer."

This opens another phase of the question: That there were over two hundred applicants for the School of Marine Engineering and not one for the War College indicates in the most forcible manner the set of the current of thought in the U. S. Navy, on the subject of higher education.

It was General Order No. 27, of June 9, 1909, announcing the establishment of the School of Marine Engineering, that disclosed the fact that there was such a large proportion of naval officers who preferred engine-room training and what it leads to, to training on deck and what that leads to. But, however brought out, the figures speak volumes for the character of our profession. We make ample provision for specialization in three of the branches of the naval profession, including the Naval Medical School, but no provision whatever for centralization. There is no provision for an educated directorate, to harmonize and co-ordinate the labors of the several specialists.

The fact that only a very few officers take up the study of the art of war goes to the very root and foundation of the naval profession. It affects the very soul and spirit of the service. It is universally admitted that we are not a military people. But it was never even so much as suspected that the military spirit was wanting in the navy, a strictly military organization and our first line of national defense!

During our early history (in 1826) a board of distinguished military engineers, in reporting on a defensive system for our seaboard, placed the navy first as being "our only species of offensive force." Furnished with suitable naval bases, "it will then be prepared," the report said, "to act the great part which its early achievements have promised, and to which its high destiny will lead." "It is an axiom in military science," the report declared, "and one fully illustrated by military history, that the worst mode of waging war, although strictly defensive, is to allow its field of action to be within its own borders; and that the best is that which assumes an offensive attitude. In our case . . . we can only assume the offensive through our navy." That is to say that the navy is to defend our coasts by assuming the offensive. To do that effectually demands the forsight of the statesman and the strategist combined. It demands timely preparation and prompt action. It demands accurate knowledge of where the "fighting engineer" is to go, and what he is to do.

But with us the "fighting engineer" must be left in this case to his own devices; for our comprehensive scheme of education has failed utterly to provide for that responsible office—a highly trained directorate. It was fully forty-one days after the battle of Manila Bay before reinforcements left San Francisco, and Admiral Dewey was obliged to telegraph home an urgent appeal for ammunition. The powerful *Monterey* (monitor) and the ammunition should have been sent him at the first indication of war. But in our system there was no one to give the word. We did not understand our own profession! How much have our line officers advanced since then in the study of the art of war?

Two wars (the Civil War and the Spanish War), have brought out the fact that we, as a body, did not know our business; and yet we complacently accept the situation and make no effort to redeem the errors of the past. There were brilliant exceptions to this sweeping assertion, in both wars, as every one knows. We are dealing here with the larger operations of war, and of the conduct of war in general. We are dealing specifically with naval administration. "*Navy, know thyself,*" is a sound Delphian injunction.

History, both military and naval, is replete with instances of aiming at a wrong objective; and positions have been attacked at great loss of life, and battles have been fought without any appreciable influence on the issues of a campaign, whereas the crucial points have been overlooked. We need not go beyond our own Civil War for examples of disastrous campaigns, both on land and at sea, conducted by leaders of undaunted courage and fired by martial ardor, but wholly ignorant of war. Indeed it was that experience that led to the establishment of this college, and yet the great body of our line officers have failed to appreciate it.

In the absence of those very rare instances of seamen and soldiers gifted by nature with a genius for war, the knowledge of military principles has been furnished by military schools, staff colleges, war schools and the like. The experience of the past quarter of a century has shown that the navy of the United States has deliberately chosen to dispense with that species of knowledge.

There is or should be an office above and beyond that of the commander-in-chief of a fleet. The conduct of war, under any

conditions, calls for the very highest proficiency as a strategist and as a politician, using that much abused term in its broadest sense. The chief of that office must be conversant with the basic principles of military science. He must be familiar with the laws of war, and of our international relations. He must be, in short, an officer of the highest professional attainments. To cover this broad field of knowledge requires years of study and reflection. His work, moreover, must anticipate hostilities. Timely preparation is essential to success in war. The first few moves in the great game may checkmate your adversary. Does it not seem pitiable that it is only a very few of our officers who are trying during a so-called "conference" to cram all these professional acquirements into four short months?

It is clear from what has been said that failure to profit by the lessons of two wars, in respect to reforms in naval administration, did not proceed from dullness of comprehension, but because the navy as a body, partakes so largely (as it naturally should) of national characteristics. As Americans are not a military people, it is not surprising to find that their navy is not imbued with the military spirit. It has been demonstrated by the official reports already quoted that the majority of our young officers prefer the mechanical arts to the military arts. But, as in the great body of Americans there are never wanting men of clear military perceptions, so, in the navy, there are officers of decided military instincts. It was hoped that this college would lead to the discovery of such officers, in order to bring them forward and induce them to follow the professional lines for which they had the most aptitude. It was a very wise step to establish a School of Marine Engineering, that, by holding out a reward for proficiency, general interest in engineering matters might be stimulated, with consequent improvement in naval efficiency. But the figures given (twenty officer-students for the School of Steam Engineering, and not one for the School of War) admonish those of you who have the interests of the naval profession at heart to renewed exertions in securing higher education along professional lines. It is difficult to understand why, in the process of differentiation of studies, and of training long foreseen but only recently inaugurated, the study of the art of war, the very purpose for which the navy exists, should be excluded. That grave error must be rectified; and the sooner, the better will it be for the country.

Those officers who come here of their own volition, impelled by devotion to their profession, will find their reward in the preferment inevitable from professional attainments.

It must be clearly understood, however, that they come here as students, not as controversialists. Each officer-student must be (to repeat it for the one thousandth time *) his own teacher. But he will enjoy the great advantage of finding, in the college staff, officers who have already been over much of the ground to be covered and who, if too modest to attempt to lead, can at least point the way. Thus will be illustrated the sound Socratic principle of "drawing out" from each student of war his military instincts.

One word here about these Summer Conferences. They are the nearest approach the college has ever reached, up to the present, of obtaining a class of officer-students. They were not what the college wanted, but the best the college could get. They have been productive of some good by showing officers of receptive minds how much there is to learn in their profession. But, on the other hand, they have been productive of no little harm, by giving officers, perhaps unappreciative, who came here for only four months, a wrong impression of what the college stands for. Called upon in conference to discuss questions in naval science to which, in many instances, they have never given a moments thought, it has been found, not infrequently, that there is a wide divergence of opinions on important subjects. Experience has shown that officers of the conferences of the past have expressed with great confidence very crude views—the views of bright but untrained minds. When these prevail, as they sometimes have done, the resultant goes forth with the *imprimatur* of the college, greatly to its detriment.

The remedy for this unsatisfactory state of affairs is simple. Let officers who have completed their terms of sea-service in their respective grades, come here for a two-year course of *study;* not for discussion, *but for study.* On the completion of such a course they will then be eligible as conferees to discuss intelligently questions relating to naval warfare—and not before.

* In the various papers on the War College this point has been repeatedly insisted upon.

An officer should not leave this college thinking he has mastered his profession when he has learned something of his terminology only. It is one of the sayings of Napoleon that to master the art of strategy necessitates incessant study and exhaustive thought. "Productive thought is the chief means as well as the chief end of education," says a recent writer. "Forming one's own opinion," he adds, "is infinitely better than borrowing one." Be good enough to understand that I am not criticising the college or its methods. I am commiserating it. Without a class of officer-students, and with a term of only four months, these conferences were in a sense forced upon the college. The college has had to take what it could get, and be thankful it was no worse.

The point I wish to make is the lack of perception by the naval profession of the proper relations between the several parts of our system of naval education. Our line officers seem to suffer from a species of "mental astigmatism" (to quote a learned authority on education *), or the inability of the will to focus the mental rays effectively upon the subject of naval education. "The rays of the mind are foreshortened," he says, "or they are unequal, or they are divergent." This is not uncommon with individual students. But it is very rare when the great majority of the members of a profession are so afflicted. Our officers fail to regard the navy as a unit, with several interdependent parts, just as the human body may be considered a unit made up of interdependent parts. The specialist can diagnose his own particular part only, irrespective of all other parts and without regard to the whole. But he only is master of his profession who can diagnose the entire body and discern the relations between the several parts and the influence of each upon the whole. Your profession is the art of war, and nature will be avenged if you violate one of its laws in undertaking to make a part greater than the whole. You give two years to marine engineering and but seventy-eight days to the study of the art you pretend to profess! This is not astigmatism. It is a total eclipse of the mental vision. You cannot even see the grim humor of it!

* See very instructive works on Education entitled "A False Equation," by Melville M. Bigelow, Dean of the Boston University Law School, and "Unity in Modern Education," by Mr. Brooks Adams.

A notable example of this obliquity of perception in regard to educational questions is to be found in the Navy Regulations of 1909. This was fully set forth in the article "On the true Relations between the Department of the Navy and the Naval War College." (See Naval Institute, Vol. 37, No. 1, page 85, par. 22.) The net result of this provision is to impair the usefulness of the college as an educational institution and to still further expose the weakness of our system of naval administration.

We have made great advances in gunnery and marine engineering and we are justly proud of it. That is gladly conceded. But after all that can be said in that respect, your profession is the profession of war; and yet, to repeat it, you do not study war. Fancy a university man aspiring to the honors of the legal profession and ignoring the law school and the science of law! The result would concern himself only and the disrepute he would probably bring, in his own small sphere of influence, upon a noble profession. But such ignorance on the part of naval officers imperils the honor of the flag and the safety of the country. What confidence can be placed in the "first line of national defense" when it is realized that those who compose it have not specialized in the art of war?

The common explanation for this extraordinary state of affairs is the absorption of the professional mind in the development of *matériel* to the exclusion of all else. But that cannot be claimed for the entire body of line officers. There are a few officers who have aptitude for certain lines of investigation—such as ordnance, gunnery, navigation, steam engineering and the rest. It is to those comparatively few we are indebted for the great advance we have made in *matériel*. What have the rest been doing? Marking time?

I have endeavored thus far to show you the relations (as I see them) which have, up to a recent date, existed between the Naval War College and the line officers of the navy; not by way of discouragement, but to stimulate you, as far as any words of mine can, to your utmost capacity to perform with diligence the work which lies before you. Recognition has come at last, and that, too, from a source which renders it all the more grateful. The General Board has delegated to the War College its most important duties: those of planning naval campaigns and of

furnishing "tactical plans." This calls for a knowledge of naval strategy, and for the solution of problems in battle-tactics—subjects which, heretofore, the navy has steadfastly ignored. How, or why, this change has been brought about it is unnecessary to state. Suffice to say that it has come and the claims of the War College as an educational institution have been recognized at last.

The object of this college is to enable officers to fit themselves to prepare these war plans. Till the time comes when a sufficient unmber of officers shall have qualified for this branch of their profession, this is obviously the only place where the work can be done. Thus the commanders-in-chief afloat and the officer who, under the Secretary of the Navy, is responsible for the conduct of war, will come to speak a common language.

This gives the college fresh impetus. And it is for you, here and now, to avail yourselves of the turn of the tide. Let it be taken at the flood. Show that the confidence in your professional ability has not been misplaced. Do this and ultimate success is assured.

It is pertinent to remark, however, that had this recognition come at the close of the Spanish War the Navy Department would have had, ere this, a War College of its own. That is to say, it would have had within its own organization, and as part of its machinery, a body of officers who have gone through a full course of study at the War College, and were competent to formulate plans of naval campaigns, and prepare tactical plans covering all possible cases likely to be needed by the Department—competent to perform, in short, all the duties of what is known in military language as a general staff, or, as already expressed, "commissioners for executing the office of commander-in-chief of the navy."

But it is idle to dwell on what might have been. Let us look hopefully to the future. A brighter day has already dawned for the college. It has not only received long-delayed recognition, but that recognition has come in the most practical manner by assigning to the college the most important and congenial work along the highest professional lines.

Nor is this all. The college welcomes to-day for the first time in its history officers who are here of their own choice for a term beyond the customary summer's conference—two officers who

well represent the military branch of their profession. They were anticipated, however, by two officers of the marine corps who greatly to their credit came here a year ago on their own application. This alone argues well for the future.

But better, far better, than all else is the presence here of the Hon. Secretary of the Navy. He has lifted the ban which has, during all these years, suppressed every attempt to develop this college to the utmost possibilities of good for the navy of the United States.

Could his words of promise have been anticipated, this paper would not have been prepared—in its present form at least.

It is hardly necessary to say that in my endeavor to show the relations between the War College and the line officers of the navy no reflection whatever is intended upon any one in office. It is the line officers of the navy as a body who are alluded to (with the exceptions noted), in their attitude towards higher professional education.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A REVIEW OF JAPANESE NAVAL FINANCIAL POLICY.

Translated from *Marine Rundschau's* article, "Flottenpolitik und Staatshaushalt, in Japan," April, 1911,

By COMMODORE W. H. BEEHLER.[1]

THE PERIOD BEFORE 1868.

Commodore Perry's landing on July 14, 1853, convinced the Japanese that foreign demands could only be resisted by a navy. In 1854 the Shogun government decided to procure war-ships through the Dutch in Nagasaki, and the Daimios of the southern provinces were authorized to possess war-ships. In 1863 the government sent two officers to study in Holland, where the steam corvette *Kagomaru* was purchased.

The greater part of the little navy was lost in 1868 by the insurrection of Admiral Enomoto, an adherent of the last of the Shoguns.

THE FIRST NAVAL DEVELOPMENT PERIOD, 1868 TO 1894-95.

The present imperial Japanese Navy was developed from the vessels remaining after the war of restoration of the Mikado with the war-ships of the Daimios of the southern provinces, Satsuma, Choshiu and Hizen. The building of the navy was delayed at first by the more urgent needs of the army to suppress internal disorders.

[1] The article published in the German semi-official naval organ is a thorough review of the measures taken by the Japanese to rapidly develop her navy, with great lack of financial resources, that seemed to make the task impossible. The financial problem was almost as difficult as the brilliant contests in battle.

The translator has abridged the original article by omitting some details of minor importance.

The navy was reorganized in 1872 on a plan substantially as at present. The expedition against the pirates in Formosa in 1874, Chinese interference there and in Korean relations, together with disorders in the island provinces, required rapid development of the navy. England served as a pattern and three armored corvettes were built there and delivered in 1877.

Progress was slow until the war with China, 1894-95. Japan could not afford armored ships but procured cruisers and torpedo boats. The larger vessels were procured from Europe; smaller vessels were built in Japanese shipyards. The first government shipyard was laid out at Yokosuka in 1871.

At the beginning of the war with China, 1894, Japan had a fleet of 32 war-ships and 23 torpedo-boats, with a total displacement of 65,582 tons and complement of 13,928 men. The annual cost of maintenance was 5,500,000 yen.[1] The nucleus of the navy comprised:

1 Armored coast defence ship, *Fuso*, of 3800 tons.
2 Old armored gunboats, *Kongo* and *Hi-Yei*, each 2300 tons.
1 Newer armored gunboat, *Chiyoda*, of 2400 tons.
4 Protected cruisers, *Itsukushima, Matsushima, Hashidate* and *Josino*, each of 4200 tons.
4 Small cruisers, *Naniwa, Takashio, Akitsushima* and *Suma*, of from 2700 to 3700 tons. *Suma* still building.

THE SECOND DEVELOPMENT PERIOD, 1895 TO 1902.

In the war with China the Japanese captured 14 vessels of total displacement of about 15,600 tons, including one armored ship of 7300 tons, one armored gunboat of 2100 tons, and one protected cruiser of 2400 tons. China lost all interest in the navy, paid a large war indemnity, and China's naval progress was set back

[1] The value of the yen fluctuated during this period.

From 1880 to 1884 the yen	= $0.90.
In 1886 one yen	= 0.785.
In 1889 one yen	= 0.74.
In 1891 one yen	= 0.78.
In 1893-94 one yen	= 0.62.
In 1895-96 one yen	= 0.5133.

Since the adoption of the gold standard in 1897 the value of the yen has remained approximately at $0.505, gold.

15 years. During this war Japan ordered two battleships, *Fuji* and *Yashima*, to be built in England, and after peace began building two small cruisers in Japan; the *Akashi* and *Miyako*. The *Suma* was launched in 1895. The cruiser *Izumi*, ex-*Esmaralda*, was purchased from Chile and arrived in Japan in 1895.

In the spring of 1896, the naval forces in Asiatic waters of Western Powers aggregated 188,000 tons, and Japan felt compelled to increase her navy.

When the prompt payment of the Chinese war indemnity was assured, this fund, amounting to 362,900,000 yen, enabled the government to submit a second ship-building program, which was designated:

THE POST-BELLUM PROGRAM OF 1897.

This program provided as follows:

1. The increase of the navy to 233,000 tons by expenditure of 213,000,000 yen in annual installments for 10 years, or until 1906. The program was practically completed in 1903, as the final installments for 1904, 1905 and 1906 were small. The last ship authorized by this program was laid down in 1902.

2. The program authorized building the following ships:

4 Battleships, each of 15,200 tons.
6 Armored cruisers, each of 9200 tons.
3 Small cruisers, each of 4800 tons.
2 Small cruisers, each of 3400 tons.
3 Torpedo gunboats, each of 1200 tons.
1 Torpedo depot ship, of 800 tons.
11 Destroyers.
89 Torpedo boats.

The ships were built as proposed, except that instead of the three torpedo gunboats they built one despatch boat and one small cruiser, while the number of destroyers was increased to 23 and that of torpedo-boats decreased to 64, besides which they procured two river gunboats. The status of domestic shipyards made it necessary to have most of these ships built abroad by contract, but even at this time they were anxious to build in Japanese yards.

DISCUSSION OF THE POST-BELLUM PROGRAM OF 1897.

A. Its Military Political Aspect.

The combined strength of foreign squadrons in East-Asiatic waters was doubtless the direct incentive of this program, though a coalition of all these navies could not have been expected. The program was systematic in providing for six battleships and armored cruisers, as that number was considered advantageous tactically, though they were more influenced by the probable time of completion.

The political weather-vane pointed steadily to Russia. The construction of the great Siberian railroad was being pushed with extraordinary vigor, which roused Japanese suspicions. This road was projected in 1888. In 1889, the stretch to Irkutsk was in operation. In 1900 the trans-Balkan and East-China stretches were operated, and in November, 1901, they completed the South Manchurian branch. In 1894 Russia began to increase her naval forces in the Pacific. In 1895 and 1896 she reinforced her troops in Vladivostok and continued to send additional troops. The Cassini treaty with China was negotiated, by which Russia obtained, viz.:

1. Permit to extend the Siberian railroad through Manchuria to Vladivostok.
2. To build a branch road via Mukden to Newchwang, and extension to the Liao-tung peninsula.
3. To station troops to guard the roads there.
4. To have control of Kiao-Chou Bay for 15 years.

Russia hesitated to take possession of Kiao-Chou Bay for fear of the jealousy of other European powers. In 1898 Russia took possession of Port Arthur.

The Japanese realized the urgent necessity of completing their program for new armaments before the Siberian railroad should be opened for traffic.

The reorganization of the Japanese army was planned to be completed by 1904, and for this in 1897 they had appropriated 81,200,000 yen, which was expended in the period to 1904. The naval ship-building program was completed in 1904, and in the meantime Japanese diplomacy postponed the inevitable collision with Russia until these preparations for war had been completed.

In 1897 the Russian Baltic fleet, which was the practical base for East Asia, consisted of the following modern ships:

5 Battleships, *Poltava, Petropaulowski, Sevastopol, Peresvjet* and *Osliaba.*

3 Armored cruisers, *Rossija, Rurik* and *Gromoboi.*

3 Large protected cruisers, *Warjag, Diana* and *Pallada.*

Japan had six battleships and six armored cruisers, built or building.

B. The Financial Political Aspect.

The estimated increase in the expenses for Japan after the Chinese war amounted 515,000,000 yen. 325,000,000 yen were allotted for the army and navy and 190,000,000 yen for public works, railroads, subventions, etc. The natural resources of Japan could not provide such sums even with the large Chinese war indemnity, since over 100,000,000 yen of this indemnity had to meet unpaid war expenses. Japan was therefore compelled to borrow vast sums of money. This paper cannot go into all details of financial operations, but only a general review.

1. In 1894 Japan negotiated loans of 125,000,000 yen. The cost of the war with China was about 230,000,000 yen exclusive of the cost of suppressing the Formosan insurrection. After paying outstanding claims, the balance of the Chinese indemnity was used for the army and navy, but the navy was also strengthened with additional sums.

2. Additional revenue was obtained by increasing the land tax, sake tax, licenses and duties on imports.

3. Loans payable March 31, 1903, were negotiated:

(a) A foreign loan of 87,600,000 yen for public works and railroads; but as coast defences were included in the public works, this was largely used for army and navy.

(b) An inland loan of 101,300,000 yen was likewise for the public works and railroads, besides which there was an additional loan of 16,700,000 yen for Formosa.

C. Some Peculiar Features of Accounting.

The budgets were usually followed by deficiency bills varying from 9,500,000 to 17,400,000 yen.

In the budget of 1897-98 the accounts for expenses of Formosa were cleverly used for expenses in all departments.

Among the receipts there appeared during the period from 1893 to 1902 the total of 19,000,000 yen from a 10 per cent tax on the salaries of officials.

There is considerable confusion, and even with full details it is impossible to ascertain the amounts expended on individual ships for construction, engineering or armaments.

THE THIRD DEVELOPMENT PERIOD, 1903 to 1911.

A. The Period from 1903 to 1907.

The Boxer insurrection in China in 1900 diverted attention from the strained relations between Russia and Japan to Japan's advantage, whose armaments were not completed. The Russian ship-building program of 1898, their occupation of Manchuria and the commercial port of Newchwang, for which they used the Siberian railroad, the increasing concentration of naval and military forces in East Asia with other measures of similar import, and the occupation of Port Arthur especially, determined Japan to increase her armaments, no matter what the cost.

The Russian ship-building program of 1898 was a reply to the Japanese program of 1897, and provided for strengthening the Asiatic fleet by 1905 with the addition of eight battleships and six large protected cruisers.

Russia then built the following: eight battleships, the *Pobjada, Retwisan, Czarewitch, Knjas-Ssuworow, Imperator-Alexander III, Borodino, Arjol* and *Slawa;* and four large cruisers: *Askold, Bogatyr, Aurora* and *Oleg*, besides the armored cruiser *Bajan*. Small cruisers not included. Japan could therefore expect her antagonist to appear off her coasts in 1905 with a superior force of 15 battleships, three armored cruisers and nine protected cruisers, to which Japan could only oppose six battleships and six armored cruisers. More were urgently needed, but whence the necessary money? But inasmuch as Russia built all except three of the above ships in her own slow-building shipyards, she could not overtake the Japanese ships being built in Europe. The prompt delivery of the *Fuji* and *Yashima* in 1897 should have been a warning to Russia. In 1903 all the new Japanese ships excepting two small cruisers had assembled in Japanese waters.

The Japanese press and people were greatly exited, and the possibility of providing still more was vehemently discussed in parliament. Programs were submitted and rejected, new elections were ordered and the new parliament passed the so-called Third Naval Law, which appropriated 99,860,000 yen, to be expended in annual installments for a period of 11 years, to build:

3 Battleships, of 16,000 tons each.
3 Armored cruisers, of 11,000 tons.
2 Small cruisers, of 5000 tons.

The ordinary revenue receipts indicated improvement in the finances; but foreign loan markets continued to be closed to the Japanese government, which was obliged to abandon the proposed reduction of the unpopular land tax. Moneys provided for railroads and public works were transferred to the navy, and all available funds from loans for railroads, telegraphs, etc., were likewise taken under various pleas for the army and navy.

THE FINANCIAL EXECUTION OF THE THIRD NAVAL LAW.

Considerable difficulty was experienced in executing the program with the money appropriated. But they were remarkably successful in building up the navy. The two big battleships *Katori* and *Kashima* were ordered to be built in England at the outbreak of the Russian war. The *Satsuma*, *Ikoma* and *Tsukuba* were launched from Japanese yards at the close of 1906, and in the next year the *Aki*, *Ibuki* and *Kurama*. The installments were insufficient to provide for the cost of the ships proposed, including two "dreadnoughts" and four large armored cruisers. Other funds had to be used.

During the Russian war the navy was provided with an extraordinary appropriation of 222,500,000 yen, of which there was a balance unexpended, of 31,500,000 yen, which was given to the navy as receipts under this new law.

For war expenses and to cover this increase in the navy, a total of 1,700,000,000 yen was expended. The cost of the war, according to the "Financial and Economic Annual" of 1896, was 1,982,200,000 yen. The national debt increased from 561,600,000 yen in March, 1904, to 2,217,700,000 yen in March, 1907.

B. The Period from 1907 to 1911.

Japan's naval losses were fully compensated by the ships captured from the Russians, viz.: five battleships, three coast-defence ships, one armored cruiser, five destroyers, three protected cruisers and 14 auxiliary ships, though some had been sunk and raised and others had to undergo very extensive repairs. Japan lost two battleships, one coast-defence ship, three protected cruisers, one unprotected cruiser, three gunboats, two destroyers and seven torpedo-boats.

With the arrival of the *Nishin* and *Kasuga* shortly before the war, the Japanese navy was larger than proposed by the law. There were no just grounds to build ships to replace those lost: these were more than replaced by the captured ships. There was need of building substitutes, not because the Japanese ships had become obsolete in that time but chiefly because they had all been launched about the same time.

A new program was discussed, however, and in the summer of 1907, a supplementing program was adopted, appropriating 333,-500,000 yen, including the unexpended balance from the existing Third Naval Law amounting to 81,930,000 yen for new ship-building during the following seven years.

From a military point of view, this 1907 supplementing program provided a substantial increase of the navy over the Third Naval Law. The naval minister declared that there was no increase, and claimed that Japan had a number of obsolete ships that should be stricken from the list. The supplement of 1907 provided for the cost of building ships commenced during the war, repairing the captured Russian ships, and the cost of material ordered from England to build the 29 destroyers. There were strong motives to prepare for a possible war with some other nation.

The supplementing program appeared during a period of world-wide financial depression. After the war there was a great boom in commercial enterprises in Japan, but the financial panic in 1907-08 was a terrific shock on the Tokyo exchange.

National development was retarded. The burden of the war taxes was doubled and trebled by so-called tax reforms. War taxes that were expected to be removed in 1906 had to be continued. Commercial and social enterprises were postponed. All improvements and buildings of peaceful character had stopped

during the war, and in the budget of 1906 only the most urgent requirements could be provided in order that all money and labor might be available for the navy. The government was anxious to nationalize the railroads; the debt had to be refunded by a thorough financial reform on a stable basis of normal conditions. The wounds of the war were still painfully felt, involving additional expenses for pensions and care of invalids. Many new problems arose, such as the expense of administering Korea and the maintenance of the large army and navy. A large part of the army was still stationed abroad. Four new divisions of the army were to be organized, and the naval program could not be carried out as proposed.

The conflict caused a change in the ministry. In 1905, Marquis Saiyoni had succeeded Katsura, the "Old Statesman," and in 1908 Katsura again resumed control as Premier and Minister of Finance. A change was made, and the budget of 1908-09 provided for a prolongation of the program period until 1915-16, or two years, and the budget of 1909-10 prolonged it another year, until 1916-17, with consequent reductions in the annual installments, to expend the money not before the end of the prolonged period.

JAPAN'S NAVAL SHIP-BUILDING LAW PROGRAM OF 1907.

1. Balance from Law of 1903, period of 11 years, Third Expansion Period 1903 to 1913:	
For new ship-building and public works, Chapter E, subsequently Chapter VI	yen. 81,930,000
Supplementing Program 1907, Period 1907 to 1913:	
(a) For continuing building ships begun during the war; for new ships; and for repairing the captured and own damaged ships.	
Chapter K, subsequently Chapters IX and X	175,000,000
Substitutes for obsolete ships, Chapter M, subsequently Chapter XI	76,577,102
Sum	333,507,102
The installments in budget 1907-08 were:	
Chapter E (VI)	10,401,094
Chapter K (IX and X)	25,000,000
Chapter M (XI)	10,939,586

The prolongations of the building periods and the reductions in the annual installments involved confusion and changes such that the building program at this date, fall of 1910, stands as follows:

Chapter VI, formerly E, new ship-building and works on shore, Third Naval Law, 1903, Third Expansion Period:

	yen.
Appropriation 1903 to 1911	99,900,000
Appropriation 1908-09, prolonged to 1915-16	71,500,000
Appropriation 1908-09, first reduction of annual installment, 3,700,000 to	8,200,000
Appropriation 1909-10, prolonged to 1916-17.	
Appropriation 1909-10, second reduction of installment, 4,700,000 to	6,400,000
Appropriation 1910-11, expended to date	53,000,000
Remaining for 1911-12 to 1916-17	46,400,000

(b) Chapter IX (formerly part of Chapter K). Replacing ships and boats lost in the war:

Supplementing appropriation 1907 to 1912-13	64,100,000
Appropriation 1908-09, prolonged to 1914-15.	
Appropriation 1910-11, expended to date	48,200,000
Remaining for 1911-12 to 1914-15	15,900,000

(c) Chapter X (formerly part of Chapter K). Repairs of captured and damaged ships; current commissions:

Supplementing appropriation 1907 until 1913-14	110,900,000
Appropriation 1908-09 prolonged to 1915-16.	
Appropriation 1909-10 prolonged to 1916-17.	
Appropriation 1910-11, expended to date	40,900,000
Remaining for 1911-12 to 1916-17	70,000,000

(d) Chapter XI (formerly M). Substitutes for obsolete ships:

Supplementing appropriation 1907 to 1913-14	76,600,000
Appropriation 1910-11, expended to date	43,300,000
Remaining from 1911-12 to 1913-14	33,300,000

BRIEF SKETCH OF INTERNAL CONDITIONS.

Katsura's ministry promulgated a plan during the latter part of 1908 for: (1) Rapid redemption of the national debt, (2) the conversion of outstanding loans to reduce the rate of interest, and (3) no new loans. The proposition included reduction of expenses, economy in administration, new sources of revenue, more equitable distribution of the burden of taxation, measures to promote the social status of the people and increase of the salaries of officials.

He began with the redemption of the first series of Treasury notes, amounting to 97,000,000 yen, which was accomplished by the end of 1908. The financial reforms were executed with remarkable celerity, so that by the end of 1910 outstanding loans were reduced 238,000,000 yen. At this time the unredeemed national debt amounted to 2,630,000,000 yen=$1,328,000,000.00.

JAPANESE FOREIGN COMMERCE SINCE 1903.

Year.	Exports.	Imports.	Excess of imports.
	In million yen.		
1903	290	317	27
1904	319	371	52
1905	322	489	167
1906	424	419	— 5
1907	432	436	62
1908	378	436	58
1909	413	394	— 19
1910	473	473	...

The financial condition has improved. In 1911 other measures, such as the income tax, employer's liability, etc., will be adopted.

Some claimed that the government had found means to provide for a new naval building program, for additional administration expenses in Korea, for building railroads in Japan and Korea, for harbor works, for regulating rivers, and for the national steel works, which would all appear in the estimates for 1911-12. This would indicate that Katsura's policy had been successful. The Japanese press was jubilant.

Trade had suffered from the scarcity of money, but revived somewhat when circulation improved through the conversion policy. There was still a lack of confidence in the stability of affairs, but confidence was eventually restored. Trade statistics demonstrated that the government was right in its predicted return of prosperity. The exports in 1910 were 59,800,000 yen more than in 1909, while the imports were 78,300,000 yen greater and balanced at 473,000,000 yen.

Complete details of trade statistics would be voluminous, but they indicate a healthy growth. The large increase of the imports of 1910 over 1909 is chiefly due to extraordinary importation of

raw cotton, amounting to 51,000,000 yen more than in 1909. The most important feature is that the importation of raw materials and unfinished iron and steel products was much greater than previously. The exports in 1910 reached 473,000,000 yen (higher than ever before), and included all classes of exports, among which the exportation of cotton yarn was the largest.

Agricultural interests are still depressed, but the most urgent need for Japan is to strengthen her national credit, which has apparently been partially successful. January 21, 1911, the Minister-President announced that Japanese credit abroad had been firmly re-established.

To return to the consideration of the naval policy, the naval administration was hampered by the prolongation of the shipbuilding program and consequent reduction of the annual installments. The delay was felt still more from the fact that the installments were inadequate to meet the higher cost of "dreadnoughts" to be built to substitute the obsolete ships. The administration was seeking the first financial opportunity to obtain more money. In 1909 the Naval Minister declared that a new naval program would be proposed as soon as financial conditions would warrant. During the latter part of 1909 the press clamored for a Fourth Naval Law, but the failure to negotiate favorable conversion of two foreign loans of 30,000,000 yen each silenced the press until the cherry-blossom season in the spring of 1910, when the fortunate conversion of the great loans of 281,000,000 yen, that reduced interest from 5 per cent to 4 per cent, justified new hopes.

The measure was debated generally during the summer of 1910, and in September the press reported that the new naval law would be submitted. The cost of administration in Korea was only 1,360,000 yen instead of the estimated cost of 12,359,000 yen, and the prospects for the navy were improved.

The desire for more rapid development of the navy was universal. The manager of the Bank of Japan declared that the proper maintenance of a strong navy was not a financial problem for Japan but a necessity for national security. The anti-Japanese agitation in the United States, together with the American policy to neutralize the Manchurian railroads and the discussion of the policy of fortifying the Panama Canal, aided the Japanese naval propaganda considerably. The "Jigo Shimpo" and other naval

organs claimed that without a very large navy Japan would not be able to maintain her national honor after 1917.

Marquis Katsura compromised, and in the naval budget, 1911-12, provided an additional sum of 82,200,000 yen to be expended in a period of six years until 1916-17.

THE ADVISABILITY OF RENOVATING THE CAPTURED RUSSIAN SHIPS.

This work was finished in 1908 by the expenditure of 60,000,000 yen, and has been unjustly criticised. The fighting value of these ships had depreciated by damages sustained in battle and by having been sunk, but they have been thoroughly repaired and have received new armaments, so that they are properly regarded as very serviceable war-ships. In the same time and with that amount of money Japan could have had two and a half "dreadnoughts" built in England, but it was Japanese policy to be independent of foreign shipyards. The domestic yards were at that time fully occupied in building new ships which required such long building periods (4 or 5 years) that they could not build substitutes for the lost ships rapidly. The repairs to the captured Russian ships served to train the dockyard personnel (the work being of a copy character, in which the Japanese excel). The renovation of the Russian ships likewise afforded the navy a convenient lever for new appropriations. These renovated Russian ships served as standards to demonstrate the superiority of new ships built in England. The moral effect in stimulating the *esprit de corps* was much greater by having these captured ships in commission than if they were kept in some naval museum or allowed to decay as wrecks.

THE NAVAL BUDGET FOR 1911-12.

	1910.	1911.	Increase.
	Million yen.		
Ordinary expenses.........	38.5	40.7	2.2
Extraordinary expenses....	37.2	45.5	8.3
Total...............	75.7	86.2	10.5

The growth of the naval budgets is shown in the following table:

JAPANESE NAVAL BUDGETS SINCE 1881–82.

Fiscal years.	Ordinary budget. (Million yen.)	Extraordinary budget. (Million yen.)	Total.	Fiscal years.	Ordinary budget. (Million yen.)	Extraordinary budget. (Million yen.)	Total.
1881-82	3.0	0.3	?	1896-97	7.4	12.7	20.1
1882-83	3.2	1.6	?	1897-98	9.5	40.9	50.4
1883-84	3.1	5.4	?	1898-99	11.2	47.3	58.5
1884-85	3.2	3.4	?	1899-00	14.6	47.1	61.7
1885-86	2.6	2.9	?	1900-01	16.9	41.4	58.3
1886-87	4.7	4.3	?	1901-02	19.5	24.5	44.0
1887-88	4.9	5.2	?	1902-03	21.1	15.3	36.4
1888-89	5.4	6.0	?	1903-04	21.5	14.6	36.1
1889-90	5.3	5.6	?	1904-05	8.1	12.5	20.6
1890-91	5.3	7.1	?	1905-06	12.3	11.1	23.4
1891-92	5.4	5.6	?	1906-07	28.0	33.9	61.9
1892-93	5.3	5.9	?	1907-08	31.3	41.0	72.3
		Navy only		1908-09	34.3	37.2	71.5
1893-94	5.1	3.0	8.1	1909-10	35.3	36.9	72.2
1894-95	4.6	5.7	10.3	1910-11	38.5	37.2	75.7
1895-96	4.9	8.6	13.5	1911-12	40.7	45.5	86.2

NOTE.—Before the fiscal year 1893-94, the extraordinary budget included the appropriations for both the army and the navy. After 1885-86, the fiscal year commenced on April 1.

JAPANESE FUNDS FOR NEW SHIP-BUILDING, AUTHORIZED 1911.

Chapter VI.	Total for the period 1911 to 1916.	Annual installments. In million yen.					
		1911.	1912.	1913.	1914.	1915.	1916.
Title 1. Ship-building.							
(a) Construction	89.8	11.6	15.3	17.0	26.4	18.5	1.0
(b) Armament	68.5	17.8	15.3	11.8	12.4	10.2	1.0
Total, Title 1..........	158.3	29.4	30.6	28.8	38.8	28.7	2.0
Title 2.							
Public Works	35.9	5.2	4.9	5.6	3.8	8.2	8.2
Title 3. Repairs and Commissions.							
(a) Construction	19.8	2.9	7.6	5.9	1.5	1.8	0.1
(b) Armaments	34.7	6.3	5.1	6.4	7.6	8.2	1.1
Total, Title 3	54.5	9.2	12.7	12.3	9.1	10.0	1.2

DISCUSSION OF THE SHIP-BUILDING FUND.

The total of 158,300,000 yen for new ship-building appears to be scant. The new big ships cost about 25,000,000 yen each, and for the proposed five such ships there will remain but 33,000,000 yen. Of this, 6,000,000 yen will be required for the three small cruisers, one-half the cost of which is assumed to have been paid. To this the cost of a fourth proposed cruiser of the same size, 5000 tons, at 4,000,000 yen must be added, leaving but 23,000,000 yen. Several installments remain to be paid for the *Kawachi* and *Settsu* which have been building for several years and which cost about 20,000,000 yen each. These two ships were laid down in 1909, in January and April, and 10,000,000 yen are still to be paid for each in two installments of 5,000,000 yen each.

There are thus but 3,000,000 yen remaining for the four destroyers, which are building, with four submarines and one river gunboat. It is not clear how the final installments have been paid for the *Aki*, *Ibuki* and *Kurama*, nor those for the *Katori* and *Kashima*, which were delivered by Vickers in the summer of 1906.

TABULATED REVIEW OF THE LAST FOUR SHIP-BUILDING PROGRAMS.

Law.	Period and amount. Million yen.	Ships proposed.	Ships built.	Remarks.
2d Naval Law, 1897.	1897 to 1906. Yen, 213.1 millions.	4 Battleships.	4: *Mikasa*, *Asahi*, * *Hatsuse* and *Shikishima*.	The battleships *Fuji* and * *Yashima* and small cruisers *Akashi* and *Miyako* were provided by former law.
		6 Armored cruisers.	6: *Izumo*, *Iwate*, *Yakumo*, *Tokiwa*, *Asama*, *Azuma*.	
		5 Small cruisers.	6: *Kasagi*, *Chitose*, * *Takasago*, *Tsushima*, *Niitaka*, *Otowa*.	
		3 Torpedo gunboats.	2 Riverboats: *Sumidi* and *Fushimi*.	
		1 Torpedo depot ship.	1 Gunboat: *Uji*.	
			1 (?): *Toyohashi*.	
			1: Aviso the *Chihaya*.	
		11 Destroyers	23: *Akebono*, *Sazanami*, *Ikazuchi*, * *Inazuma*, *Oboro*, *Shinonome*, *Murakumo*, *Yugiri*, *Kagero*, *Shiranuhi*, * *Akatsuki*, *Kasumi*, *Asashino*, * *Niji*, *Shirakumo*, * *Harusame*, *Arare*, *Asagiri*, *Usugumo*, *Ariake*, * *Hayatori*, *Fubuki* and *Murasame*.	
		89 Torpedo boats.	64: viz., 16 first class, 37 second class, 11 of third and fourth classes.	

* Names of ships marked * are those lost in the war.

TABULATED REVIEW OF THE LAST FOUR SHIP-BUILDING PROGRAMS—Continued.

Law.	Period and amount. Million yen.	Ships proposed.	Ships built.	Remarks.
3d Naval Law, 1903.	1903 to 1913, prolonged to 1916. Yen, 99.86 millions.	3 Battleships.	2: *Katori* and *Kashima*.	1 battleship and 2 armored cruisers to be built.
		3 Armored cruisers.	1: *Ibuki*.	
		2 Small cruisers.	2: *Yahagi* and *Hirado*, building since summer of 1910.	
		6 Submarines.	7: Nos. 1 to 7.	
1907, 1st Supplementing Program.	From 1907 to 1913 and prolonged to 1916. Yen, 333.5 millions.	2 Battleships.	2: *Kawachi*. *Settsu*, begun in beginning of 1909.	To be built. 1 armored cruiser and 1 small cruiser.
		1 Armored cruiser.		
		2 Small cruisers.	1: *Chikuma*, begun May, 1910.	
		5 Destroyers.	5: *Uranami*, *Isonami*, *Ayanami*, *Kaifu* or *Umikase*, begun March, 1909, and *Yamakase*, begun June, 1910.	
		2 Submarines.	2: Nos. 8 and 9.	
Further Supplement to 1907 Program.		Exact details not known.	(a) The final installments for ships in the old budgets, viz., *Satsuma*, *Aki*, *Kurama* and *Tone*, out of war funds. (b) Substitutes for obsolete ships *Tsukubi*, *Itoma*, *Yodo* and *Mogami*.	The *Nishin* and *Kasuga*, which were bought just before the Russian war, are not accounted for. Probably paid from war funds.
2d Supplement, 1911.	From 1911 to 1916. Yen, 248.7 millions.	1 Battleship.	Not yet begun, though the ways of the *Kawachi* have been vacant since October 15, 1910.	
		4 Armored cruisers.	1: Ordered from Vickers Sons & Maxim, November, 1910.	
		No small cruisers.	Ceased building small cruisers. One still to be built, by program of 1907.	
		? Destroyers.	3 are building, exclusive of the *Kaifu* and *Yamakase*.	
		? Submarines.	Nos. 10 to 13 building.	
		? River gunboats.	1 building.	

During the war Japan decided to build 32 destroyers and ordered the necessary material from England. Three of these were provided for in the budget of 1907, and 29 were built out of the war funds, viz.: *Hatsushimo, Minazuki, Nagazuki, Kikusuki, Yunagi, Matsukase, Asakase, Asatsuyu, Hatsuyuki, Harukase,*

Hayakase, Hatsuharu, Hibiki, Yayoi, Yagure, Yudachi, Kamikase, Kisaragi, Mikasuki, Nenohi, Nowake, Oite or *Oitase, Shiratsuyu, Shirayuki, Shirataye, Shigure, Ushio, Uzuki, Wataha.*

The Japanese naval administration has been held back in its earnest effort to rapidly build up the navy. In comparing Japanese naval strength with that of other nations the following table of comparative budgets is apparently more unfavorable to Japan than it really is.

NAVAL BUDGETS, 1910–11.

	Total budget.		For ship-building exclusive of repairs.	
	1910–11.	1911–12.	1910–11.	1911–12.
	In millions of yen.		In millions of yen.	
England	381.0	430.0	180.0	147.1
Germany	207.0	215.9	106.7	115.0
United States	266.0	258.0	67.0	69.0
France	180.0	196.7	56.0	68.7
Russia	94.7	118.1	18.5	81.0
Japan	75.7	86.2	27.1	29.8

Japan's probable naval strength in 1917 will be 14 battleships, including four renovated Russian ships; 17 armored cruisers, including one renovated Russian ship. The oldest ships will be *Sagami*, ex-*Peresvjet* ('98) and *Tokiwa* ('98). Ships launched over 20 years are obsolete and not counted.

In 1917 Japan will have nine ships of the *Dreadnought* type, of which five will be battleships and four armored cruisers.

It is therefore evident that considering the inadequacy of Japan's shipyards and steel-works she cannot overtake the preponderance of the United States, nor that of any of the other first-class naval powers, by 1917, without reference to the completion of the Panama Canal in 1914.

A repetition of the plan of purchasing large quantities of armaments abroad, as was done before the Russian war, is forbidden by internal political, as well as diplomatic, relations. Besides, the lack of big ships, to meet any opponent in the immediate future, is not necessarily a political set-back for Japan. Her geographical position, the strategic advantage of which has not

been overestimated, outweighs any opponent's advantage, though her shipyards are inadequate. One glance at the map will demonstrate this clearly. In any war, no matter with whom, except China and Russia, the result will be decided at sea. Supported by Kure and the Inland sea, whose approaches and islands are strongly fortified, Japan will operate on interior lines and wear out any superior naval forces, except England's and soon overcome her enemy.

Without going into details, it is only necessary to note that the three exits of the Inland sea are flanked by the great military ports Yokosuka, Sasebo and Maizuru, and that an attacking fleet would be obliged to watch the second-class military ports of Takeshika, Gensan, Chinkaiwan and Makung, besides all other fortified harbors in Japan, Korea and Formosa, before the Japanese navy could be crippled.

Notwithstanding the Marine Minister is reported to have submitted a plan for new loans, with the idea of obtaining funds for a larger navy, nevertheless the negotiation of a new loan will not be followed by an increase of the navy. While better prospects appear for the country, the affairs are far from satisfactory. A saving has been made in cost of interest, though not as much as expected; credit has been strengthened, and trade has improved, yet the people are still carrying the burden of the bulk of the war taxes, and agricultural interests are greatly hampered. A revision of the income tax is expected in 1912-13, a reduction of the land taxes is contemplated for 1913-14, and in 1914-15 the postponed military budget is expected, so that the navy will be obliged to wait until 1915-16.

Conversion of new loans will be used for carrying out the proposed new tax laws. It is doubtful if the revenue receipts will be increased by the new tariff, and Japan will have to make concessions which will enable reduction of taxes.

Japan must consider other obligations, such as the railroads and regulating the rivers. The budget for 1911-12 contains an item of 180,000,000 yen for river improvements, which amount will be expended in a period of 18 years in annual installments, 12,500,000 yen being that for 1912-13.

The financial status does not indicate any probability of any increase of the navy.

The financial status is completed by the following exhibit:

FINANCIAL STATUS.

	1902-03.	1911-12.	Increase.
	In million yen.		
Ordinary receipts	221.2	492.1	270.9
Extraordinary receipts	76.1	48.8	− 27.3
Sum	297.3	540.9	243.6
Ordinary expenses	171.0	407.1	236.1
Extraordinary expenses	118.2	133.8	15.6
Sum	289.2	540.9	251.7
National debt	552.2	In Dec., 1910. 2630.0	2077.8

JAPANESE DOMESTIC SHIPYARDS AND STEEL-WORKS.

Japan early recognized the necessity of adequate iron and steel works for national defense, but the results of efforts to establish such plants efficiently have not been satisfactory. Japan consumes about 750,000 tons of crude iron annually, of which about 140,000 tons are produced in Japan, and only 180,000 tons of steel. Her iron and steel products are also inferior to those of foreign countries. Japan lacks skilled engineers and labor to compete with foreigners. The works have suffered chiefly for want of sufficient quantities of suitable iron ore. The high cost of iron ore, most of which was imported from China, as well as the high cost of suitable coal, are reasons why the works have not paid.

JAPANESE IMPORTS OF PIG-IRON AND ORES.

From—	1909.	1908.	1907.
	Yen.	*Yen.*	*Yen.*
China	600,000	913,000	753,000
Korea	565,000	416,000	149,000
Others	9,000	2,000	7,000

The national steel-works at Wakamatsu should yield a maximum of 159,000 tons, and when the proposed enlargement is completed, for which 12,400,000 yen were appropriated, to be expended in installments for several years, it is expected to yield about 300,000 tons annually. The works are operated at a loss and are far from paying expenses, which amount to 56,000,000

yen, and thereby have an annual deficiency of 1,500,000 yen. The new Anglo-Japanese steel-works at Muroran will deliver guns and projectiles for the Japanese army and navy, together with railroad material. This establishment has not yet managed to exist. The effort to obtain 10,000,000 yen for building these domestic plants has not succeeded. The future development of these plants is uncertain, and the Japanese naval administration cannot depend upon them.

Recent development of excellent iron and coal areas in Korea indicate a possibility of improvement in the steel production, and the importation of iron from China has largely decreased.

The lack of confidence in the quality of domestic steel products is demonstrated by the rejection of products of the Wakamatsu works on acceptance tests by the military inspectors, which caused great loss to that national plant. The naval minister declared that the naval steel-works at Kure cannot supply the wants of the navy, and that the Wakamatsu works could only supply limited quantities. The delay in completing the guns has repeatedly delayed the completion of ships. Last year the naval administration was obliged to give Armstrong, Vickers & Co. a large order for twelve 12-inch guns.

Duties have been laid on foreign iron and steel products to develop domestic works, and the Subvention Law of 1910 especially provides for importation of ship-building material. The effort to become independent of foreign ship-building has not been fully successful. Japanese ship-building industry cannot compare with foreign plants. The failure of the domestic steel-works and lack of skilled naval constructors and skilled labor contribute thereto. The Naval Minister declared that while it was greatly desired to build all Japanese war-ships in Japan, it must be confessed that such ships are built much better abroad. This statement in the fall of 1910 followed the order given to Vickers & Maxim for one 28,000-ton ship, which will apparently serve as a model for building sister ships.

Parliamentary Co-operation with the Naval Policy.

It has often been asserted that the Japanese Parliament is a complacent body, and instead of the despotism of the Shoguns there is an overstrained militarism and the control is divided by two families, the Satsuma and Chosu. These claims are mis-

leading. The parliament cannot remain silent regarding the political policy nor refrain from giving the masses of the people, who have recently become civilized, a voice in the affairs. Nothing is more natural than that other capable travelled men will participate in the constitutional management of affairs. The present skilful leaders deserve the thanks of the people, and if they should withdraw at this time the country would be thrown into a chaotic condition. The people must first be qualified for a constitutional government. The transition can only be gradual. Any student of Japanese politics will have observed that there are evidences of a break in the healthy development of Japan. To-day new social laws are being discussed. Rome was not built in one day.

There has never been any well-defined opposition party in the Japanese Parliament. Marquis Katsura has had an agreement with his opponents, the liberal majority, who have 204 votes out of 367. The liberals have, however, co-operated with the Administration. This concord was recently disturbed by the rejection of the government's proposed railroad measure, the necessity of which was not clear. The Administration is closely identified with financial banks, and most of the enterprises are decided in secret conferences with bankers and the Cabinet.

CONCLUSIONS.

1. In considering a people's willingness to make sacrifices, it is necessary to know their efficiency in both military and industrial affairs.

2. The conduct of the naval policy before the Russian war was admirable; after the war this policy should have been more in keeping with the needs of the country. The unfavorable financial status limited the appropriations for the navy. The last estimates became necessary because of the higher cost of modern ships, especially due to increased displacement and larger-caliber guns.

3. The alliance with England and the treaties with China in 1909 and Russia in 1910, influenced Japan's naval policy, without which Japan would have had less money available for the navy. The treaties with Russia and China did not relieve Japan from the necessity of building strategic railroads in Korea.

4. The influence of the Panama Canal on Japanese naval policy may be ignored, as heretofore, Japan must endeavor to decide any war in Japanese waters.

5. The bulk of the Japanese navy has become obsolete in a few years. A new large increase must soon follow, but this cannot take place before 1914-15 without delaying the tax reforms and army requirements, etc. The increase of the figure of total tonnage displacement of the Japanese navy by 1917 can be accomplished only by purchasing large quantities of material to be ordered from abroad in 1914. This is hampered by the inefficiency of Japan's shipyards and steel-works, upon which gigantic sums have been expended without satisfactory results. The available and proposed war material, in conjunction with the geographical strategic position, insure Japan's national safety.

6. Japanese naval policy has been restricted by the inefficiency of her shipyards and steel-works and improvement in this respect is not evident. The costly effort to develop them is, however, justified.

7. The co-operation of parliament in the naval policy has not been questioned in Japan as in other countries. The budget committee does not submit any naval program which may be disputed. The Administration and the majority in the parliament have worked in harmony, which is a satisfactory substitute for a parliamentary ministry.

8. The peculiar hankering for secrecy which has characterized Japanese naval policy can no longer be maintained so strictly. Fleets cannot be built in secret.

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RECOLLECTIONS OF THE CHINA WAR OF 1860.

By Captain Arthur C. Hansard.

It is perhaps seldom remembered by the present generation that the occasion when Field Marshal Count Waldersee led a combined force to the relief of the embassies and consulates was not the only instance when British sentinels had done duty on the walls of Pekin. It has been written that the city was taken and pillaged. Pillaged it certainly was not, neither is it quite correct to say that it was taken. The sacking and burning of the Summer Palace, situated some five miles from the city itself, may well have led to the misapprehension about the city being pillaged. That deed of retribution was a just and necessary one, a reprisal for a gross act of treachery on the part of the Chinese, by which they captured a number of Europeans and Sikhs composing the invading force.

Some two years previous to this expedition the Pei-ho river had been closed to prevent an embassy from proceeding to Pekin, and in 1860 a British force, under Sir Hope Grant, together with a smaller force of French under General Montauban, afterwards Comte de Palikao, was sent to force the passage of the river past the Taku Forts. This is generally referred to as the Third Chinese War. The war ships and transports assembled at Talien Wan, better known to-day on account of its proximity to Port Arthur. Congregated in this bay were, at the lowest calculation, one hundred vessels, and of all imaginable sizes and rigs, not even omitting the innumerable Chinese junks with their peculiar sails.

I was only a young middy at the time and had just arrived from England. On arrival at Hong Kong everybody was overjoyed to learn that we were in time for the expedition, and we proceeded to the rendezvous without any unnecessary delay.

Whilst here I was transferred to a gun-boat, and I felt that this would give me a better opportunity of seeing shore duty.

All being ready, a fair start was made for the Pei-ho river, where it was intended to effect a landing close to Peh-tang on the south bank, and near the Tanku Fort. The landing force was embarked in launches, and the gun-boats, each having half a dozen of these launches in tow, made in for the shore. In all, there were some twenty or more gun-boats. The weather was by no means very promising, and almost as soon as we started it came on to rain in torrents. However, wet as it was, a landing was eventually effected without opposition on the part of the enemy. Owing to some of our boats getting stuck in the mud, the French were the first to make a landing, and our men, in many cases, were compelled to wade through mud right up to the gates of Peh-tang, where they bivouacked, still in the mud, with only one blanket and a waterproof sheet. It was just a case of water everywhere.

The natives that remained in the vicinity appeared to be friendly enough, offering such assistance as was in their power. The utter indifference they displayed at our presence and the way in which they continued their work was astonishing, but I believe that this was entirely due to the fact that they could see we had a great number of Chinese coolies in our employ.

To the 60th Rifles, who, together with the 15th Punjab Native Infantry and a battery of artillery, formed the 2d Brigade, belongs the honor of firing the first shot in the Third China War, for early in the morning some Tartar cavalry were seen not far from the Rifles' picket, and they were fired on. It was ten days after landing that an advance was made, and Sin-ho was the first place to block our progress. The brunt of the fighting and hard work was borne by Sir Robert Napier's brigade, one battery having a very narrow escape, the enemy's cavalry being within a few yards of it. The work of all hands was rendered very unpleasant by the very muddy and heavy nature of the ground. Within the fort the natives had laid some ingenious traps with a view to our sudden exit. These consisted of large tins filled with powder and placed in a deep hole, and there connected by a rope to a musket. The hole was lightly covered with dirt on a piece of matting; the weight of any man on this would naturally cause it to give way, and his falling on the rope would cause an

explosion of the musket. Luckily these were too obvious to let anybody get caught and no accident occurred. The next obstacle to our advance was the partly fortified town of Tanku. The artillery shelled the place for about an hour, then the 1st Royal Scots, the 60th Rifles and, if I am not mistaken, the 31st Regiment rushed in and succeeded in driving the enemy out. The next afternoon the river overflowed and the Rifles had a lively time of it, their camp being inundated, and great difficulty was experienced in saving their baggage. The following day was employed in making a bridge of boats to enable one brigade to cross the river and attack from the other side. During this work the guns in the Taku Forts were continually fired at the working party, our own artillery replying with interest. It was here that the Armstrong gun was first used in war, and the first shot fired was, to say the least, a very erratic one. During the afternoon and evening our men were hard at work securing the approaches to the forts, and the Chinese, naturally anxious to ascertain what we were doing, threw up, at intervals during the evening, a great number of fire balls of all colors, a sight well worth seeing and long to be remembered.

In the gray dawn the Tanku Forts loomed up in the distance and looked formidable enough, and well might the Chinese think them impregnable and quite sufficient to stop our advance. The attack was commenced early and the fire soon became fast and hot, the Chinese gunners having our range pretty well and being fairly good marksmen. After about two hours' firing, a terrific explosion was heard; this proved to be one of the magazines, and was caused by a well placed shell from our artillery. This explosion was immediately followed by a second one in the fort nearer the sea, on which the gun-boats were firing. These explosions did not, as we naturally expected they would, cause the Chinese to cease their fire, which they did not do till some time later when the forces, both by sea and by land, had drawn considerably closer, their fire decreasing as ours became hotter. Then a breach was made and the flags of England and France were placed on the walls. The 67th Regiment was the first to enter, closely followed by the French 101st of the Line, whose colonel, judging by his name, did not count all his ancestors as Frenchmen, and an after acquaintance with Colonel O'Malley convinced me that he was a thorough Irishman, even to having

been born in Ireland, and to hear him say, "Arra', good marning an' how are ye" sounded just too natural, and made him immensely popular with us all.

It was during this part of the campaign that I first saw a deed of bravery that won the coveted Victoria Cross. It has since been my privilege to see four other deeds of valour that won a similar distinction, one of those being a young midshipman.

The punishment thus far inflicted did not prove sufficient to induce the enemy to surrender the remaining forts, and fresh troops had to be hurried up from Tanku. Their work, however, was not very heavy, as the Chinese, seeing determination on our part, soon surrendered, the soldiers submitting quietly to being made prisoners, first throwing away their arms.

As soon as that fort had been secured, a heavy thunderstorm broke, the whole country looked like a great lake, and the return to camp at Tanku was most difficult; the guns were stuck axle-deep in the mud and the men were knee-deep wading through it, and now I began to bemoan my fate and wish myself snug and sound on board the little gun-boat again. There yet remained what was known as the Southern Taku Fort, but after considerable discussion Mr. (afterwards Lord) Loch managed to get the enemy to surrender, when all the forts were occupied. A large quantity of warlike stores and some very valuable guns were captured. And so ended the first part of the campaign, and the Pei-ho river was open for navigation as far as Tien-tsin. Our losses had been rather heavy, amounting to about fifty killed and some three hundred wounded—the brunt of the fighting, and consequently the losses, being on the British side.

The occupation of Tien-tsin was effected without any resistance, some of the troops arriving by land, the others by water on the gun-boats. Negotiations were carried on for several days, but no settlement was arrived at and a further advance on Pekin was decided upon, the distance being about ninety miles. As soon as this became known, peace was again sued for and it was agreed that preliminaries should take place at Tung-Chow, a town at the navigable head of the Pei-ho river and about ten miles from the walls of the sacred city. With the object of making arrangements for camping grounds and the provisioning of the troops, and while the preliminaries were being discussed a party of British officers and officials, to the number of abo

forty, and including Mr. Loch, Mr. Parkes (afterwards Sir Harry), Mr. Bowlby, the special correspondent to the *Times*, Mr. de Norman and others, together with a like number of French officers, was sent forward to Tung-Chow, escorted by five troopers of the 1st King's Dragoon Guards and a small detachment of the 11th Bengal Lancers under Lieutenant Anderson. The party, in high spirits and with light hearts, entered Tung-Chow, little thinking of the terrible fate that was so shortly to befall them. They had commenced their inspection of the place and were busily engaged making the necessary arrangements when the Chinese army outside the walls suddenly got under arms and, cutting off retreat from the town, enclosed the unsuspicious advance guard like rats in a trap. Colonel Beauchamp Walker and four troopers of the K. D. G., seeing what was going on outside, immediately sent to warn those inside of their danger. At the same moment a French officer and his orderly were attacked and Colonel Walker with his companions galloped to their rescue. The Frenchmen made a gallant stand, but were soon disarmed, cut down and hacked to pieces, but not before the officer had shouted a word of warning with his last breath to the Englishmen. Then Walker and his gallant little band dashed forward, sword in hand, and cut their way through the Chinese army amidst a storm of bullets. They did not, however, reach their lines without paying toll, for Colonel Walker and Mr. Thompson were both hit, the former in the hand. He had his sword wrested from him in the mêlée, and Mr. Thompson received a thrust in the back. The troopers displayed coolness and gallantry, but they, too, had a man hit, and when the party, galloping and breathless, reached their lines, a loose horse, wounded and riderless, fell dead in front of Sir Hope Grant, a sure messenger of "bad news."

The allied commanders were already aware that a large cavalry force was somewhere in front, having observed the remnants of the encampment they had just abandoned, and they had, none too soon, agreed upon a plan if obliged to fight. General Montauban wanted to attack at once, but Sir Hope Grant, with cooler judgment, decided to give the Chinese a chance to keep their promise, rightly saying that the first shot from our guns would be the death warrant of our people in Tung-Chow. He also desired to await the return of Mr. Parkes, the interpreter,

who, the general remarked, from his intimate knowledge of the Chinese and their ways, was worth an army in himself.

During all this time and up to the very last moment the Chinese did not cease their traitorous farce of sending mandarin after mandarin, some of them of high rank with many retainers, to arrange the details of our reception; the last one arrived only an hour before Colonel Walker and his party were seen scurrying across the plain chased and wounded, and he had the effrontery to demand an interview with Lord Elgin to settle the ceremony of the ambassador's entry to Pekin. The General told him that ambassadors did not march with the advance guard of an army, but since it was a question of etiquette he would like to know why the place appointed for our reception was still occupied by the Tartar army. Not a whit discomfited, the mandarin coolly replied that there was evidently some mistake and that he would immediately order the army to retire. There could be no doubt now that some treachery was afoot and an instant attack was decided on; in fact there was nothing else to be done, for the allies did not number over four thousand men at most, and they could not hesitate in front of an army of thirty thousand Tartars. As the French force had no cavalry, except the personal escort of the general, consisting of a few Saphis, General Grant had, as an act of friendly courtesy, lent him a squadron of Sikhs (11th Lancers), who were soon made use of. The two commanders shook hands in front of the troops and the French general galloped off to open the engagement on the right by turning the left flank of the enemy and so driving them under the fire of the British guns. After some cannonading, Montauban ordered his cavalry to charge and away went the little band of Sikhs and Saphis with turbans and burnous fluttering in the wind, and they ploughed a furrow as they went, and as far as the eye could follow, in the midst of the Tartar host. They reached a battery of five brass guns which they promptly took, sabering the gunners as they attempted to run from their posts, themselves losing an officer killed and another wounded. Montauban continued his advance and presently came upon a force of sixty bronze guns on a canal bank; a flank artillery fire was brought to bear, the guns were quickly dismounted and the Tartars were thrown into confusion, and they retreated, leaving all their guns in our possession.

Sankolinsin was the Chinese commander, and a man of great repute amongst them: he was a burly-looking Tartar, somewhat short of stature, and had a red, pimply face, as if he indulged too freely in samshu, the native spirit. Our soldiers called him Sam Collinson, and declared he was a runaway from the Marines. His Tiger Guard was dressed in yellow and black striped uniform to imitate that beast.

But what of the captives in Tung-Chow? As soon as the battle was over, a demand was sent to the taotai or governor of the town for the release of the prisoners. He replied that they had already been taken away and that he knew nothing more about them. We do know now, but we did not at that time, that they had been bound hand and foot with green withes, then thrown into a common country cart and sent off, some first going to the Summer Palace to gratify the eyes of the Emperor and his ladies, and then to forts further up country, where they were murdered or left to die, whilst the others were sent direct to Pekin, where they were put in cages, horribly tortured and many of them done to death after days of terrible cruelty. Captain Brabazon of the Royal Artillery and the Abbot Duluc were put to death on the field after the battle of Palikao Bridge, several days later. Of these two nothing was ever found except a small piece of artillery overall and a small bit of the missionary's cassock. A year later the father of the gallant officer came to China to search for the remains or to find some relic of his lost son; but a careful and anxious personal enquiry led to no discovery, and to this day his last resting place is unknown.

It may here be stated that an edict signed by the Chinese Emperor was found in the pocket of a mandarin of high rank that was killed at Taku, directing that all his subjects should kill and destroy the barbarians, as they were malicious beasts. The manifesto further put a price on the heads of the ambassador and the generals.

As the prisoners were no longer in Tung-Chow and the enemy had withdrawn from that town, it was decided to march direct on Pekin. The Chinese had determined to play their last card and make a stand at the Palikao Bridge, a handsome white stone structure over the canal which joins Tung-Chow with Pekin and completes the waterway between the city and the sea. Here they had assembled a great force of cavalry, supported by guns and

infantry; they numbered from fifty to sixty thousand men, and the allies perhaps five thousand. On the morning of the 21st of September, three days after the battle of Chang-Kiawan, the allied forces marched to the attack and the battle commenced: the Tartar cavalry moved slowly and with great precision, taking their orders by flag signal from a gigantic Tartar who stood near the head of the bridge with an enormous flag of black and gold, and who acted as a kind of fugleman to transmit the orders of their commander-in-chief. More than once did the mounted hordes gallop up to within fifty or sixty yards of the French front, quickly correcting any gaps or confusion in their ranks by the withering fire of the infantry, returning again and again to the attack. To envelop the small force was evidently the plan, and continued well-executed attempts were made to get round our flanks, also to get in between the French and ourselves. But Armstrong shells and French shrapnel did their work, and presently the heavy masses began to break and a well-executed movement to the rear began. Before this had set in, however, the British cavalry force, consisting of two squadrons of the K. D. G., the 11th and 19th (Fane's) Sikhs, had a rare opportunity which they did not neglect to take advantage of, and thirsting for revenge for the base trick which had entrapped their comrades, every man's blood was up when the order came to charge. Then did Lancer and Dragoon, with set teeth and willing arm, prepare to take vengeance on the treacherous Tartar. The enemy awaited them on the opposite side of a sunken road with a four-foot drop into it and a six-foot bank on the other side. The Tartars had chosen their positions cunningly, quite expecting to see the "barbarians" tumble into the road, or at any rate to be put to confusion and disorder by it. On came the glittering wave of steel, and, although the sunken road and bank shook the symmetry of the formation, they easily surmounted these obstacles and in another moment were in amongst the Tartars, who, mounted on their sturdy little cobs, were just the right height for the sword arm of a dragoon. The Indian lancers, separated by a village from the British, did capital execution on the left, but a dry ditch put most of their rear rank down, so they only accounted for one hundred of the enemy as against over two hundred cut down by the heavies. The huge signalman remained, as if he had a charmed life, at his post on the bridge till the very last; cool,

erect, and regardless of the slaughter going on around him, he stood his ground with courage, never attempting to budge an inch, even when left alone amongst the dead, until at last he fell, shattered by a French shell, and still grasping the flag-pole; he fell amidst the admiration of his foes.

There was nothing now between the allies and the capital, nothing to save it; and yet, notwithstanding the fact that the "barbarian" was at their gates and their Emperor was on the point of flight, the stupid arrogance and incredible pride of the celestials would not allow them to give up the prisoners. Temporizing and excuses were again resorted to, and they would get up all sorts of trickery to gain time. They assured us that the prisoners were all well and that their presence at Pekin was a guarantee of our pacific intentions, and that they would be given up when the treaty of peace was signed and we had withdrawn our troops. Such were the excuses put forward by Prince Kung, brother of the then Emperor. A fortnight had been wasted in foolish talk, all of which ended in nothing. The prisoners had not been returned and there was no sign of their being released, and the cold weather was fast approaching; so on the 5th of October Lord Elgin found himself forced to direct an advance on Pekin.

On the following day the two armies, marching within easy distance of each other, soon found themselves within sight of the city; but at this moment the French were missed, and now occurred a circumstance that caused some ill-feeling at the time and much discussion afterwards. The French found themselves at the close of the day at the far-famed Summer Palace, situated about five miles from the city and at the foot of the first range of hills, and they very promptly proceeded to pillage it, whilst our cavalry brigade, which had lost touch with our own force, joined the French and occupied itself in outpost duty around the vast structure to guard against surprise. As for the rests of our force, unavailing search was made by them for the French, and when night fell they bivouacked in front of Pekin on the ground agreed upon. At daylight the next morning, October the 7th, Major Garnet Wolseley, D. A. Q. M. G., was sent out to find our allies. Taking a small escort, he made a shrewd guess as to the best direction in which to start his search, and soon came across the trail of our cavalry in the direction of the Summer

Palace. The Frenchmen seemed as free with excuses as the Chinese, for they made enough in trying to account for their mysterious disappearance. Sir Hope Grant joined forces with the French and the removal of what remained was methodically carried out, the soldiers working in parties under their officers. A prize committee was appointed and everything that had been collected was sold at auction, when exceedingly high prices were realized; the total amount so obtained was used as a prize fund. The writer is still in possession of a pair of lady's slippers which cost him just about ten times as much as they were really worth. To describe the splendors of this Palace would require a far abler pen than mine. I have heard the French likened to bees on a summer day, with gold watches hanging to their buttons and their pockets stuffed with priceless pearls and precious stones, magnificent musical boxes playing as they danced with excitement on gorgeous silks and furs which strewed the ground as mere dirty rags in the mud. At length the busy toilers, tiring of their work, turned to amuse themselves by breaking the vast and beautiful mirrors on the walls. Loot! the very delirium of loot! The French officer to whom I am indebted for a description of the pillaging, when speaking of the scene, said it was a veritable nightmare. Whilst to the French undoubtedly belongs the blame, if any, it must not be supposed that the English had not a hand in the sacking. It was an act of retaliation in which we took a lively hand, and, late as we were, we managed to secure not a little valuable booty. For instance, I asked another midshipman of my own ship if he had secured anything of interest; he carelessly pulled a handful of rubies and other stones out of his pocket, saying: "Oh yes, I got a few of these kinds of things"; and I showed him a regular chunk of cornelian which was then doing duty as a letter weight, but was afterwards cut, and a piece of it forms a pendant for my watch chain. Then there was a lucky individual who found a joss about three feet high which had been upset from its pedestal and was lying on the floor unnoticed; but he had not been through the Sepoy mutiny for nothing, for the ugly joss found its way to England, where it realized five thousand pounds. Comte d'Herrison mentions that a Saphi, his orderly, brought him a handful of pearls which he refused, but which the man sold for a bottle of brandy to another officer. True enough, brandy was a luxury and was worth a hundred

francs a bottle—if you could get it—but then, the pearls were worth from forty to fifty thousand francs at the least. Rennie's "British Arms in China" gives a good description of the Summer Palace, with its lakes full of gold fish and its many beautiful water-birds.

On the 8th of October the allies again started for Pekin, and the Chinese were notified that the prisoners would have to be released and in the British lines and the city gate opened, otherwise an entry would be forced. About two o'clock that same afternoon the prisoners were brought in to our lines, or at least as many of them as remained alive. Of the twenty-six English and Sikhs and thirteen French entrapped at Tung-Chow only eleven of the former and six of the French were restored. Lord Loch, in his "Personal Narratives," tells of the indignities to which he was subjected, the cruelties and the horror of hanging to a rafter by the wrists and ankles as if he were a hammock, and the agonies of thinking that each day would be his last. Sir Harry Parkes also gives a good account of his sufferings and troubles and how he was brought out nearly every day to be executed.

The allies were quartered outside the Anting Gate, but the great difficulty was to find anybody holding a responsible position to treat with, as all the principal mandarins had gone away, those who remained being nothing but minor officials and understrappers, who certainly had no power to treat; neither did it appear that any of them had any great desire to do so. The situation was, to say the least, an embarrassing one, for here we were, to all intents in possession of the city, but nobody would take any notice of us. We had no desire to have the capital of the Celestial Empire on our hands, but to get the treaty signed as soon as possible so that we might get away before the Pei-ho river was frozen over and the rigors of winter set in, thus preventing our getting away for at least three months. However, after considerable persuasion and by showing them the risk they ran of having their city given over to pillage and destruction unless they acted at once, they managed to find Prince Kung, who came with fear and trembling to treat for peace. In the meantime the British siege-guns had arrived and everything was in readiness for breaching the walls unless the Anting Gate was given up as security and as a guarantee of good faith whilst the

ambassadors entered the city to sign the treaty. At noon on the 13th the guns were to open fire unless the gate were previously surrendered. As the time approached, no sign was made from within the city. The scene was an interesting one; the field and breaching-guns were in position, and the gunners were standing to their guns, which were ready loaded, and the officer only awaited the word to fire. Sir Robert Napier stood, watch in hand, and every field-glass was directed at the gate and every eye was turned in the same direction. The order to fire was almost on the lips of the general when the gate was seen to be opened and the surrender was announced, and a few moments later the 67th Regiment and the 8th Punjabees entered the city, and guards were posted on the walls, and field-guns were placed near the gate so as to secure all approaches, and the position was placed in a state of defence.

Prince Kung, having been assured of his own safety, had returned to the city—if he had ever been out of it, which is very doubtful—but even at this crisis, when the guns were ready to open fire on the city, it was the same old story of procrastination and every effort was made to postpone matters. It had to be, however, so on the 24th of October Lord Elgin entered the city in great pomp with an escort of five hundred men and proceeded to the Board of Ceremonies, where Prince Kung, with the usual formalities, attached the Great Seal to the treaty, which was thereupon signed and exchanged. Several days later the French treaty was likewise exchanged, Baron Gros proceeding to the Board of Ceremonies in a Sedan Chair. Embassies were established and Mr. Bruce was appointed first British Minister to the Court of Pekin, and on the 9th of November Lord Elgin and Sir Hope Grant, with the troops, left on their return journey to Tien-tsin, and the China War of 1860 was over. The war was over, but there yet remained to be collected an indemnity of two million pounds sterling, together with one hundred thousand pounds to be paid to the families of the murdered prisoners. Until this amount was fully paid and our minister safely installed in Pekin, a strong brigade, consisting of Fane's Horse (the 19th Sikhs), two batteries of artillery, the 31st Regiment and a detachment of Military Train, under the command of Brigadier General Sir Charles Stavely, occupied the city of Tien-tsin, where they were cut off from all communication with the outer world on account of the river being frozen over, for the next four months

Several gun-boats were also frozen in at the same place, that to which the writer was temporarily attached being amongst the number. Every preparation was made on board ship to meet the severe cold of the winter and the heavy snowfall was provided for by roofing in with canvas or boards, and as little work could be done, we had to do our best to provide healthy amusement. Drill was regularly performed on the ice and on the snow when it had set hard enough to allow free movement on it. There was, of course, any amount of skating, and sufficient ground was cleared of snow to allow of foot-ball being played. Fishing in Chinese rivers did not much appeal to any of us, and there was no shooting to be had. When the frost broke up and allowed a movement on the river, I was fortunate enough to be ordered up to Japan to join my own ship, where I was stationed till the middle of August, 1865, taking an active part in the expeditions to Kegoshima and to Shemonoseki; but of those little episodes I have told fully elsewhere, and they have nothing whatever to do with the China War of 1860.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SOME NOTES ON THE TRAINING OF MARINES FOR ADVANCE BASE WORK.

By Major Henry C. Davis, U. S. M. C.

It must become apparent to officers of the Marine Corps, as time goes on, that their function as a part of the Naval Service is becoming more and more clearly defined.

That function is to have at the disposal of the Navy Department a trained force ready and organized at all times for Advance or Mobile Base work.

In the training of the young officers who come into the corps, no matter from what source, particular stress is necessarily laid on the fundamentals of military education, and that training is therefore confined to the essential military features of their particular and peculiar duties as officers of the Marine Corps ashore and afloat. It is not my purpose to suggest any changes in that course as it now exists and is taught at the School of Application, but I would like to suggest something for the training of such officers of the Marine Corps as are fortunate enough to be allowed to attend the Advance or Mobile Base School.

In the organization of a force for Mobile Base work, the three most important heads or subjects under which others come in the formation of a course are the Infantry, Artillery and Signals, under this last head being included all the electrical features of the work.

Under Artillery are included mines, countermining and boom construction. Signals would also include, under the general heads Visual and Electric, the sub-heads Wireless, Buzzers and Sounders, Ardois, Wig-wag, Whistle, Semaphore and Telephone Installation.

It will therefore be necessary, in the organization of an Advance Base force, to include officers who have specialized in these main divisions; that is, in Infantry, Artillery and Signals.

Beginning with the Infantry, we must first assume that at the place where the school is located there is stationed not less than a full regiment of marines which will be available for the instruction of the officers and men in infantry-drill regulations.

The main features of the present infantry-drill regulations, in so far as they apply to close-order formations, are, I think, acceptable to most officers and need not therefore be changed except in one or two minor points which are not of any consequence.

In the application of this same book to the battle exercises, or as it is at present called, the "normal attack," we are forced to recognize its absolute failure to meet modern conditions.

The theory that troops must be thrown into the firing line in a steady stream is correct, but that it will ever be possible to do it, under fire, as prescribed in the drill book is questionable to such an extent that the author does not hesitate to say he believes it utterly impossible.

In designing any attack formation no set rules can be laid down, because no mind is capable of foreseeing the sudden changes which take place on the field of battle and which must be met by the resourcefulness of the unit commander nearest the point of change.

All that can be done is for the commander of the regiment to assemble his officers, previous to the action, and give them as clear and concise an idea of his desires as possible. He will assign the objective for his force and when the force is committed to the action its accomplishment of his wishes will be dependent on the subordinate commanders, for modern arms and the cover necessary for protection from them, will prohibit the colonel from doing much more than exercising general supervision on the advance of his entire line.

In prescribing exercises for this training of troops, we have certain tactical situations which are as old as the military art and which will probably never change unless the air men develop machines which will alter tactics and the military art materially, and the battle exercise of the future must be one in which the company commander is made to feel that his most important duty is to get to the firing line with as many men as possible fit to go on with the attack. There can be no doubt but that any body of troops in a modern action will begin to

dig shelter as soon as the enemy's fire is felt. The first shelters will probably be more for concealment than for protection, and as each advancing echelon leaves the shelter it has constructed the following will strengthen it, and the next will in turn strengthen it until we will have in our rear a rallying point well defended by hasty entrenchments.

This must be taught the infantry soldier, and he must be made to feel that a knowledge of how to use and construct cover may sometime save his life on the field of battle.

Another vitally important matter is the rapid and continuous supply of ammunition to the troops in the firing line after the action is well started. The dead and wounded will form a small and immediate stock to replenish from, but some organized system of supply must be worked out and its faults discovered and corrected by constant practice, in time of peace, so that only a little changing will be necessary in time of war, when all the faults of any system originating in peace are sure to be brought to the surface.

The other features of infantry training as they are now taught at all barracks would of course be included in the school, and it is not necessary to go into them here.

A subject which must be considered and very earnestly considered is that of land transportation as it would apply to an Advance Base. It must be first understood that the author makes a very clear distinction between Advance Base forces and Expeditionary forces.

The Advance Base force would probably always operate near to the ship or unit which transported it and would itself be based on that ship, whereas an Expeditionary force might be called on to go to any distance. Only the former is considered here.

Up to the present time, as far as the author is aware, all transportation between marines in camp on shore and the base ships has been done, as far as the shore part is concerned, by that omnipresent badge of a marine force on shore—the ever faithful *push cart* hauled around by marines. It has been successful for that purpose in a very eminent manner, but the author believes better and quicker results with less strain on the men would be obtained by other means of shore transportation. There should be portable railroads for the Advance Base forces and motor trucks for the Expeditionary forces.

If the use of motor trucks is too radical, then at least the quartermasters should have sufficient funds to hire enough draft animals and vehicles to take this work off the shoulders of the fighting men.

I have stated that in my opinion there should never be less than a regiment at the place where the school is located, and I think even better results would be obtained by keeping a brigade of three regiments organized for this particular work at two large posts, one on the east coast and one on the west. The logical places are League Island and Mare Island.

The organization of the regiment for Mobile Base work has been the subject of much thought on the part of the author, and a very brief idea of it is given here.

The regiment should consist of 1 colonel, 1 lieutenant-colonel, 3 majors, 13 captains, 1 captain quartermaster and commissary, 15 first lieutenants and 18 second lieutenants. There should be 12 companies of 105 enlisted strength and 1 company added, to be formed, after the regiment had arrived at station, from the cooks, messmen and other special-duty details, and I would place this company under the charge of the quartermaster of the regiment. Sufficient extra men should be added to the 12 companies, so that the loss of these special-duty details would not reduce the effective strength below 105.

The 3 additional second lieutenants are for the command of the automatic-gun details, and two guns should be assigned to each battalion of the regiment, with the final formation of the detachment much the same as that used at Camp Meyer in Cuba last winter.

Inasmuch as there is no permanent company formation in the Marine Corps, this additional company, formed of the special-duty men, etc., is a simple matter, and, allowing for sick and other casualties, each of the 12 companies of the regiment would always have practically the same strength available for drills and other military duties.

Let us now briefly consider the Artillery of an Advance Base force. It is most likely the artillery of this force would not exceed the 50-caliber, 7-inch gun of the Navy, and it would range from that down to the 3-inch, 50-caliber, for use on the field and semi-permanent platform mount.

It must be understood that what follows is based on the

author's understanding that the artillery of an Advance Base force is to be used for preventing raids and landing parties, and not for attacking ships.

It would be faulty to expose gun positions by replying to the bombardment by more powerful artillery afloat or by any use of them until a landing force had started from the hostile fleet.

Guns of 6-inch caliber have been landed and mounted by marines, and the problem has been one of handling the guns after they are on shore. This has been done in various ways. I am informed that at Olongapo they were skidded up steep hills by the use of blocks and tackle to their positions. The author transported one 6-inch gun over two miles of water, landed it on a beach and then transported it three miles on land from sea level to 188-foot elevation in that distance, by the use of a large pair of lumber wheels and block and tackle; and the force at his disposal for the hardest part of the work was 25 marines, for the country got so rough the owners of the carabaos used in hauling along the so-called road would not allow the animals to be used *because the rocks would cut the hoofs to pieces.*

Different places necessarily call for different methods, but it seems that the method most suitable for all places (from my own experience) would be large wheels with very wide tires and some rapid scheme of lifting the gun off the ground and lowering it to the ground.

The main objection to using the tongue of the wheels for this, used as a lever, is that the strain on the tongue frequently breaks it, and a delay is caused which, with some other method, would be obviated.

At the school there should be a force of men whose special drill would be in the handling of the guns, mounts and platforms contemplated in the Advance Base material.

The officers should have special instruction in ballistics, sights, range finders, manufacture of guns and ammunition, selection of gun positions from maps and charts and the actual work of placing a battery in position.

Officers who had specialized in this subject I would assign to the unit of the force which had had the special work of handling these guns and drilling at them.

In any artillery practice accurate range finding is the first essential, and therefore accurate spotting of shots is necessary.

The ease of finding ranges from shore stations is such that not a great deal of time need be spent on that subject, but the training required to rapidly and intelligently transmit this information with other firing data from the fire control stations to the batteries does require much time and careful training, and a part of the artillery force would require very accurate drill on this subject.

The matter of connecting the batteries and the fire-control stations requires a more or less expert knowledge of electricity as applied to this kind of communication.

This it seems to me should be gone into by officers who have an aptitude for this sort of thing, and they should be trained to apply their knowledge to the solution of such problems of communication as would arise. Searchlights and their use and care would also come under these officers, and it would seem that a body of men should be trained in electricity in the same manner in which men of the electrical corps of the Navy are now trained.

Submarine mines would be a part of the Artillery course, and the planting of mines both for defense and for countermining would be a part of the studies. The actual work of placing the mines must be added to the theory of mine warfare. Certain companies would have this particular work and their officers and men would be thoroughly taught in mines.

There is also contemplated, in the present Advance Base organization, the employment of torpedoes discharged from stationary floats. This complex piece of machinery requires very careful handling on the part of those whose duty it is to use it, and this knowledge can only be obtained by careful study supplemented by the actual work with the delicate adjustments of the engines of a torpedo.

The Secretary of the Navy will very properly demand that when the material of an Advance Base is placed in the hands of the officers who are to use it these officers have the training and the expert knowledge to keep that material efficient and ready for use at all times.

I strongly maintain that no amount of book knowledge will enable any officer to do this unless he has had the practice with these varied and complicated machines. Therefore every feature of the Advance Base organization and outfit should be included in the equipment of the school, and the knowledge of its use be imparted there in theory and in *practice.*

Defensive booms are mentioned "en passant." The English proved that a destroyer would ride over a boom unhurt, but they would certainly very seriously interfere with a steam launch and tows of a landing party and therefore their construction and placing in position is to be taught. It is my desire to convey the idea that all marine officers attending the Advance Base School would get a working knowledge of the various subjects taught there, but to those who had shown any aptitude for special subjects as mentioned here I would try to arrange the course so that those officers could specialize in the desired subject.

If the time arrives, and we presume it will, when various points have garrisons which are really Advance Base forces, I would try to make the details for those posts as much as possible in the branch in which the officer going had specialized. After a tour there and on next assignment, I would try to change the duty or the branch so that officers would get varied duty.

Time and again forces of marines have been ordered out on very sudden notice, and many problems *which should have been solved at home* have been worked out upon arrival at station after a certain time had elapsed. In time of war the fact that these things had not been foreseen might prove a very serious handicap, and the locking of the stable door after the horse has been stolen has never yet proved to be a very good preventive measure.

The location of the school in some yard where plenty of space is available for drill and work is necessary. During the summer months the men can be placed under canvas and the lack of barracks should not prevent the force from being assembled at such yard as is most useful for this work now, and being kept there till the barracks could be built.

The vast bulk of the Advance Base material would require a lot of storage space, and to quickly get it out for use and shipment the force should be familiar with the methods of packing and unpacking, and in the event of its use for business *the way of putting it on a ship is very important.* It has been known to happen that guns have been sent to the front without carriages, and wagon bodies without wheels, and other equally serious mistakes have been made which could have been prevented by a little drill and foresight.

The only method of solving all the problems likely to arise in the consideration of the needs of an Advance Base outfit,

is by concentrating the minds of the officers composing the force on the problem, and it is to be earnestly hoped that the few ideas given here will help bring about a greater interest and a clearer understanding of the gravity of the situation as it now stands.

We have work to do and no tools with which to do it, because the tools have not been fashioned from the rough material at hand.

NOTE.—The terms "Advance Base" and "Mobile Base" are in my opinion synonymous; and while I have used "Advance Base" more frequently, it is from habit rather than intention.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SPERRY GYROSCOPIC COMPASS FOR NAVAL VESSELS.

By Lieut.-Commander H. C. Dinger, U. S. Navy.

For many years the problem of obtaining a satisfactory compass for naval vessels, especially for use as battle compass, has been one beset with all manner of difficulties. In order to avoid errors caused by masses of iron and steel about the compass, chart houses, bridge rails, fittings and instruments on the bridge or in the vicinity of the compass have been made of brass or other non-magnetic material. If the compass is to be below in some protected position, it is naturally surrounded by various masses of metal. With all precautions that seem to appear feasible, it has been impossible to secure a satisfactory magnetic compass that can be used in the conning tower or central station of a battleship, or below in a submarine. Even those compasses which are above decks, on the bridges and steering stations, are very erratic under battle conditions. Electric alarms, distant control, search-light appliances, telephones, etc., when near the compass, affect it in various ways; while the shock of firing guns and the training of the turrets throw the compasses off to a very material extent.

To conduct accurate battle maneuvers with a fleet, an accurate and reliable compass is essential, in order that courses may be steered exactly and that each change of course may be exact. Likewise, in taking bearings for tracking or plotting the position of the enemy, accuracy of compass is a prime necessity. Applying corrections for compass error is always a disconcerting operation, and opportunities for applying corrections in the wrong direction are always present. Especially is it necessary to have an accurate compass at conning tower or other ship-control station; but with the magnetic compass it seems hardly to be possible.

The development of the gyroscopic compass so that it has reached the stage of commercial practicability gives us promise of a remarkable step in advance in securing an accurate and reliable compass, that will enable courses to be steered with precision and bearings taken accurately while ship is swinging, as well as when she is on her course, and will permit these bearings to be immediately plotted, without loss of time or opportunity for misapplying corrections.

The principle of the gyroscopic compass is in brief general terms as follows: A gyroscope set rotating and freely suspended will eventually take a steady position of equilibrium with its axis parallel to the axis of the earth, and its direction of rotation the same as that of the earth. This can be shown by taking a small toy gyroscope and, while it is spinning, moving it in a circular path. The axis of the gyro will take a position in the meridian with reference to the circular path in which the gyro is moved, and if the motion is reversed the gyro will immediately tumble and thus make its direction of rotation that of the movement to which it is subjected. A gyroscope once in the meridian will resist any force tending to move it out of this position, the resistance increasing with the size of the gyro and the speed of the revolution. Thus any gyroscope of sufficient size and speed of revolution might be used as a compass. The larger the gyroscope and the greater its speed of revolution, the more directive force will such a gyroscope possess.

In order to secure good directive force the gyroscope must have a high speed of revolution and be of fair size; but sufficient directive force can be obtained with practical running speeds, and without making the apparatus cumbersome.

The Sperry gyroscopic compass uses the principle of the gyroscope, but the practicability of its use lies largely in the mechanism for showing the headings without bringing any appreciable force upon the gyro. This apparatus has been the result of years of study and experiment.

The following is a brief description of the apparatus, the description being assisted by several views of the compass and its accessories.

The apparatus consists of a master compass, repeating compasses, the motor generator and switchboard. The master compass, with attachments, is shown in Figs. 1 and 2. The gyroscope

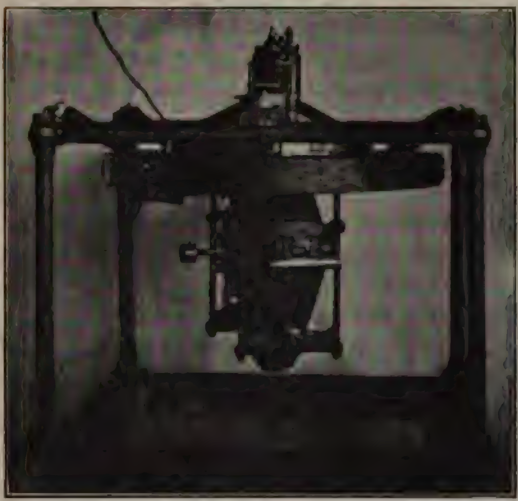

FIG. 1.—Master Compass as Mounted.

FIG. 2.—Master Compass as Mounted.

is driven by an alternating motor and is included in the gyroscope case. This gyroscope is well protected by its case and is suspended by a piece of pianoforte wire. The gyroscope is operated at a speed of 8000 revolutions per minute. The gyro carries a pointer and contact maker which moves over a contact circle: and as the heading changes, the contact circle moves over this pointer contact maker and this brings into operation the azimuth motor (shown at top of apparatus), which brings the compass circle around to correspond to the position of the gyroscope. It is really only an electric follow-up gear.

The contact circle, compass circle, motor, etc., are carried in gimbel rings, and the apparatus is suspended by springs from some part of the ship's structure. This can be seen from the photograph. The only force exerted by the gyro is to move the contact maker, and this force is practically nil, and there is thus no tendency for the compass to lag and the compass is sensitive to even very small changes in heading. There is a correction made for the speed of the vessel. This correction is very small and only amounts to about two degrees for a difference of thirty knots. The speed correction is made by means of a cam which slightly changes the position of the compass circle. The adjustment is made by moving a pointer over a dial.

The heading by master compass is communicated to the repeating compasses by an electric step-up apparatus; the connection being made at the edge of the compass circle, and it is put into operation as the heading changes. The exact heading of the master compass is by this apparatus given to the compass card of the repeater compass. Repeating compasses are connected by means of a two-wire cable, and as many repeating compasses as may be deemed desirable can be connected, and they can be located anywhere. The repeating compass consists of a small bowl containing the step-up motor, which operates a compass card similar to the card used on magnetic compasses. This card can be seen in Fig. 3. The mechanism of the repeating compass is small and simple, and it is easily portable, the cable being the only attachment required.

For furnishing the current for the motor and alternator, there is a motor generator set, mounted on a common base, and this with a small switchboard completes the apparatus. The electric power required is very small, only a few amperes. An attachment

is also made for operating the gyro in a vacuum. Operating in vacuum materially reduces the power required for operation.

The master compass is located below decks in some well-protected position, and adjacent to it are placed the motor generator set and the compass switchboard. At installation the apparatus is adjusted, and the adjustment once being made, the compass can be stopped and started as desired.

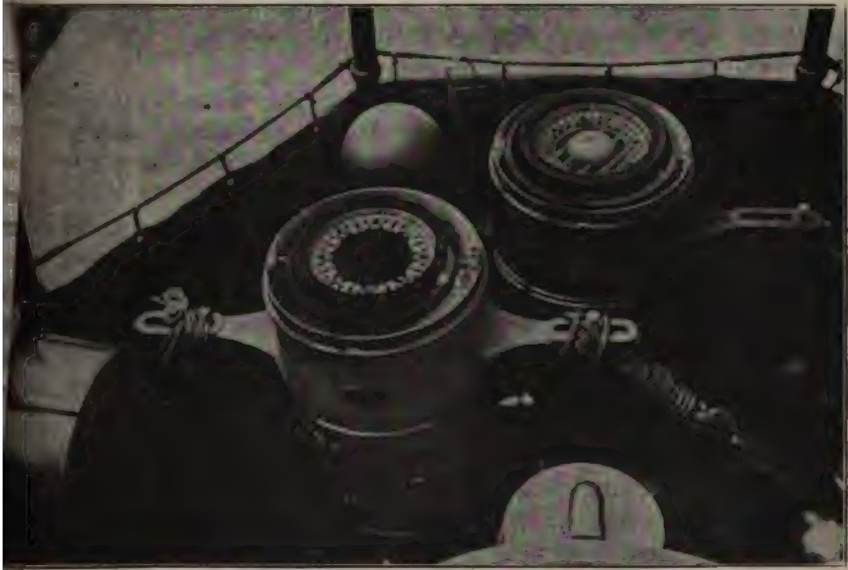

FIG. 3.—Magnetic Compass on Right, Sperry Repeating Compass on Left, as Mounted on Bridge of a Destroyer, Temporary Experimental Installation.

In order to avoid a large number of vibrations past the meridian, and to hasten the settling of the compass in the meridian, a dampening device is fitted. This allows the compass to come to rest in the meridian with but a few vibrations across it. Means for lubricating the various bearings are provided. Spare azimuth motors, and motors and parts of repeating apparatus, can be fitted without disturbance of the gyro.

Starting Compass.—The compass is put in operation by starting the gyro motor. When all connected up and motor generator in operation, this is done by simply throwing a switch. If the

compass is set so as to be approximately in the meridian, it will adjust itself so as to point true north in a few minutes. If started ninety degrees away from north, it will require about two hours to get settled down on true north. After having settled down in the meridian, it will remain there as long as kept going. In port, whenever the compass is not wanted it can be shut down and started again before getting under way. The compass can be started from any heading it may be on, and will itself find the meridian. If it is started near the meridian, it will adjust itself much sooner than if started from a position away from the meridian.

The gyroscopic compass is subject to no magnetic influence whatever. It can be located anywhere, and any mass of magnetic material can be moved about it with impunity. Variation is eliminated, and there is no change due to change in longitude, temperature or heeling. The compass always points true north. The master compass can be mounted at or near the center of motion of the vessel, and, as it is suspended by springs, rolling and pitching have no appreciable effect upon it. There is no heeling error and the compass maintains its heading steady while rolling, and is sensitive only to actual changes in course. The repeating compass is not affected by either its position, motion, or surroundings; it can be placed or moved anywhere as long as it has its cable connected.

POINTS OF ADVANTAGE IN USE.

The following points of advantage in using this compass readily appear.

(1) *Steadiness.*—As long as the course is not changed, the compass does not move. Rolling, pitching, or vibration do not cause the compass to move, and there is no vibration or swinging of the compass. The helmsman can thus keep *right* on his course to a degree of exactness never to be approached with the magnetic compass. For fast vessels the exact steering of courses is most important and may make a material difference in the actual space traversed by the vessel.

(2) *Reliability.*—As the compass points true north and is not subjected to any magnetic influences either in or outside of the vessel, and simply depends upon keeping the gyroscope in motion, there is practically nothing to throw the compass out.

(3) *Adaptability and Flexibility of Location.*—The master compass is placed below in some well-protected place, but the repeating compasses can be placed anywhere and in any position, and can be moved from one position to another at will. For plotting work the compass can be put right on the plotting board and any bearing plotted directly from it.

(4) *Accuracy.*—All courses can be steered accurately without having to look up the deviation or variation. All changes in course can be made exactly without running the risk of introducing errors in deviation or variation.

(5) *Safety of Compass Installation.*—The master compass being in a thoroughly protected position, there is no danger of having the compasses knocked out by shell fire or other damage to the vessel. Repeating compasses can be connected in anywhere, and can be shifted from one place to another, and all these compasses will read alike and are accurate.

(6) *Recording Feature.*—A continuous recording apparatus can be attached to the compass, and from such a record the course actually steered and any variations in course are recorded. Such a record will be of great value when running in a fog, in night attacks, etc.

One class of naval craft in which it has been especially difficult to obtain a satisfactory magnetic compass is the submarine. On these craft the compass must necessarily be close to many sources of magnetic disturbances, and hence the magnetic compass is unsatisfactory. The gyroscopic compass overcomes all such difficulties that have here been found. The master compass can be located below, and the commanding officer can carry a repeating compass around with him from whatever position he may be handling the vessel.

The Sperry gyroscopic compass has been exhaustively tested and experimented with ashore. It has been tested on the merchant steamer *Princess Anne*, and has also been tested on several naval vessels. These tests have shown it to be an entirely practical apparatus and an accurate compass. The compass is now being manufactured on a commercial basis, and the principal field for its use will no doubt be naval vessels and the large passenger and freight vessels.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

FUTURE DEVELOPMENT OF THE NEW YORK NAVY YARD.

By Naval Constructor W. G. Groesbeck, U. S. Navy,

and

Civil Engineer F. R. Harris, U. S. Navy.

1. The following plan of development or rehabilitation of the New York Navy Yard, is the result of study and consideration on our part, extending over very nearly one year, and while it is not intended to be comprehensive in detail, it is intended to show the possibilities in the way of developing the present site, with possibly a small addition, to meet the needs of the naval service, particularly with a view to providing adequate berthing facilities for a large fleet of first-class battleships, under such conditions that entry and egress to the station from the East River may be possible under all conditions of tide, and without the many hazards, the loss of time, and the expense involved under existing conditions; and with a view at the same time, to providing a modern, compact manufacturing plant for ship-repair or ship-building, if desired, such plant to have the usual advanced facilities for economical handling and routing of material, with the necessary modern storage capacity for material, trackage and crane facilities.

2. The reason that has prompted us in the preparation and submission of this joint suggestion is that it has come to us from various sources that the consensus of opinion among many officers of the navy, and possibly of the Department itself, is that the present New York Navy Yard, including its location, natural facilities, disposition of shops, plant and water-front, are entirely inadequate and unsuited for its purposes under modern conditions. It has frequently been stated, though perhaps not officially, that

the Navy Department would do well to dispose of the entire site and plant, and look for a more suitable location, probably above the City of New York, upon the Hudson River. The present location of the yard, however, we consider to be ideal from the point of view of supply, both of labor and of materials; and we have been led, in view of the above-mentioned proposition of a change in site, to investigate the possibilities of the present site as regards its development in an adequate and satisfactory manner. When first considering the question in its broadest sense, we inquired into the various properties along the water-front of the greater city, and in fact, the lower Hudson River, and came to the conclusion that there was no site so well adapted to a first-class navy yard and ship-repair and building plant as the present one. This opinion is most emphatically strengthened in view of the investments the Government has already made in the present site in the way of buildings, dry docks and plant, which, with some modifications and additions, may be developed into an ideal navy-yard plant.

3. It may, perhaps, be well to mention here the consideration given to the subject and the work previously done, within the last ten years, with the same end in view—the improvement of the New York Navy Yard. On September 24, 1904, the Navy Department appointed a board of which Rear-Admiral Frederick Rodgers, U. S. N., was senior member, to make thorough examination and complete report concerning the navy yard, New York, with a view to determining what changes should be made so as best to meet the requirements of the naval service. Accordingly, the Rodgers Board report was submitted. The report was very comprehensive and dealt with the subject at issue in great detail, although along broad lines, and was in general approved by the Navy Department. It contemplated the removal of what is known as Cob Dock and the purchase of certain property to the west of the present naval reservation to Hudson Avenue, and at the same time laid down a plan for the improvement of the waterfront, consisting of building out piers from the mainland, etc. This report in itself, it is understood, was based on, and in general approved of, a previous report of a board of which Rear-Admiral P. F. Harrington, U. S. N., was senior member (Sen., Doc. 165). On November 19, 1907, the civil engineer of the yard,

Mr. Gregory, submitted a report which in turn was reviewed by Captain J. D. Adams, U. S. N., captain of the yard, and Naval Constructor W. J. Baxter, U. S. N., somewhat modifying the water-front recommended by the Rodgers Board report; but in December, 1909, Rear-Admiral J. B. Murdock, U. S. N., then commandant of the yard, submitted to the Department several plans of water-front improvement, conforming very closely with the recommendations made by the Rodgers Board report. This last-mentioned plan of development was approved and the work now being done is somewhat based upon this approved plan.

4. The plan at present being followed out, which involves the improvement of the water-front solely, is believed to be defective in the following particulars:

(a) The wharves built and to be built from the Ordnance Dock into East River are so located as to be remote from the yard shops and extremely difficult, on account of the tidal conditions of the East River, to get in and out with a vessel, except at slack water; with the tugs available in the yard, it is probably only possible to get one vessel out or in each day.

(b) The wharves in the inner basin, now Wallabout Channel or Whitney Basin, are so short in length that the prows or sterns of modern battleships would project out beyond their extremity.

(c) The spaces or slips between the wharves are so narrow that, with the increased beams of first-class battleships, it would be impossible to place two battleships in a slip, as had evidently been originally planned under the condition of much narrower beam.

(d) Pier "A," proposed by the Rodgers Board on the down-stream side of the basin, cannot be built because, with the East River tidal conditions, it would be a menace to vessels entering the inner basin.

(e) The reports and studies made did not consider the necessity for additional docks of greater length and width, and probably did not foresee the necessity for rebuilding dry docks Nos. 2 and 3, in the near future.

(f) The examinations and recommendations made did not consider, or possibly did not foresee, the early development of the navy yard into a ship-building plant having the facilities of building, if desired by the Navy Department, first-class battleships of

great tonnage in practical competition with commercial shipbuilding yards; and it is doubtful as to whether the growth of the fleet, both in number of ships and size, is provided for in both water-front improvement and shop facilities.

5. Up to the present time, it has, from necessity, been the policy of the Navy Department, when vessels of the fleet have been in New York Harbor, to anchor all those not actually undergoing repair at Tompkinsville or in the Hudson River; the berthing space for ships has been so restricted in the yard that the yard has been sorely pressed to provide berths even for those ships actually undergoing repairs or waiting for urgent repair. Even so, vessels have had to be shifted time and time again on account of this restriction. The various accidents that have occurred during the short stay, in connection with ships in this harbor while anchored in the Hudson River, are well known, but have been unavoidable. The plan suggested by us will permit berthing practically the entire Atlantic fleet in the navy yard basin, without interfering with repair or new building work.

6. Six separate steps of development are shown, and are described as follows:

Step No. 1, Plate 1.—From the present yard to the condition shown on Plate 1, in which Building No. 10, joiner shop and C. & R. power plant, Nos. 115 and 117, and 6 and 7, are shown as removed and replaced by fabricating shop for the Hull Division and a covered building ways. Dry Dock No. 4 is shown as completed, as is also Pier "D." It will be noted that one of the present cantilever cranes over the building slip is shown to the north of the fabrication shed covering the storage yard. This seemed to be a good disposition of this one crane, which the new covered building slip will put out of service. Attention is invited in this connection to the fact that the present cranes and runways are already inadequate as regards length, height and reach for the construction of Battleship No. 34.

Step No. 2, Plate 2.—Provision and clothing factory is moved from its present site to Building No. 126, and a new modern storehouse is shown. The storehouse is so arranged that stores can be handled directly from cars, elevated to various floors, and distributed by industrial track to different sections of the building. A new fitting-out pier provided with crane track and a berth

on either side for vessels is provided. The remaining portion of Cob Dock is removed. A railroad transfer float is provided at Pier "D," so as to give convenient access for railroad cars to the manufacturing portion of the yard, doing away with the long haul now necessary over Cob Dock and Cob Dock causeway. The fitting-out pier will be recognized as taking the place of two piers (B and C) in the Rodgers Board report. It is imperatively necessary to keep this pier over 250 feet from Pier "D," so as to allow a 110-foot ship and the 125-ton crane *Hercules* to lie between them.

Step No. 3, Plate 3.—Dry Dock No. 2 is shown rebuilt of the same width as Dry Dock No. 4, and 850 feet in length, long enough to take a battleship cruiser of the most advanced type. Forty-ton crane track connections are shown to the Steam Enneering Shops, adequate lumber storage sheds are provided to the east of Dry Dock No. 3; a lighter slip is to be built directly under the proposed cantilever crane near the Hull Division fabricating shed, so that material may be handled from the lighter directly into the plate and shape storage racks. Piers and slips are built out from the present causeway.

Step No. 4, Plate 4.—Dry Dock No. 3 is rebuilt of the same width as Dry Dock No. 4, and 1100 feet long, arranged with an intermediate gate so that the dock may be used to dock two moderate-sized vessels, the inner compartment to be used for long-time repair, or the full length of dock may be availed of to dock commercial vessels of a transatlantic-liner type of the most advanced length. This provision is made in case such vessels should ever be needed in transport service for the transportation of troops or as scout cruisers.

Step No. 5, Plate 5.—The major part of Ordnance or Cob Dock is removed and is replaced by wharves placed at such an angle that ships after coming inside the basin, being protected from current action, may come into or go out of the berths between the wharves under their own steam or with slight assistance from tugs. Oil storage tanks are provided for oil fuel and a new coaling plant is shown. Building No. 75, the present antiquated and obsolete pattern shop, is replaced by an up-to-date and modern pattern shop.

Step No. 6, Plate 6.—Shows the property to Hudson Avenue acquired by the Government, as recommended by the Rodgers

Board, and wharves and slips constructed in this vicinity, and also provides a space to the west of building ways No. 2, for an additional building ways, or as a fitting-out basin.

Plate 7.—Shows a general lay-out with some details of the proposed storehouse. The size and height of this building need not necessarily be followed, although the arrangement for economical handling of stores we believe worthy of consideration as a feature of economy and one that, if capitalized, would well warrant the outlay.

Plate 8.—Shows general details of the Hull Division fabricating shop with the ship-building ways. The shops are so laid out that raw material may be delivered by railroad car to the transfer bridge on Pier "D," and, with a very short haul, moved to the storage yard, or directly under the cranes of the shop; or, material may be brought up by lighter to the lighter slip and then removed by the cantilever crane to the plate and shape storage yard or directly into the fabricating shop. The fabricating shop is so arranged that, by means of overhead cranes, raw material is taken into the shop and then handled throughout its course through the various shops by similar cranes; and in case it is to be used for ship-building, moved directly out to the ship-building shed under the crane serving the ship-building ways. The ship-building ways is partially enclosed, so that work may be carried on upon the ship under construction irrespective of weather conditions. Further, the ways itself is built in a permanent manner, to do away, once and for all, with the continual rebuilding of ship ways, which has been a marked feature of ship-building at this yard, and an item of expense that has inevitably been charged to the ship itself, then under construction. It is believed that, with these facilities for repair and building work, the economy brought about, if capitalized, would undoubtedly more than twice over pay for the cost of those facilities. No additional shops are shown for the Machinery Division, as it is well known that the shops already constructed at this yard for this division are commodious and economical in their arrangement, and can only be improved upon in small details. The shops are located conveniently to the dry docks and water-front. Extensions and additions may be required in the future, but will be of a minor order.

7. It is believed that the dry docks provided would easily serve

any call that would be made upon the yard for facilities of this character, and further statements with respect to their possible use are so self-evident as to be unnecessary of detailed explanation.

8. As will be seen, the wharf and slip arrangement of water-front improvement practically makes the entire yard an enclosed basin, which, while of course subject to tidal influence, will be almost entirely uninfluenced by the river currents. The slips are so located that, with perhaps two or three exceptions, entry or egress is readily obtained with very little assistance from tugs. The entry to the basin is of such width and so placed that it should be possible to bring a vessel into the slack-water basin without difficulty at any period of tide or current.

9. There is also submitted, marked Plate No. 9, a development of the navy yard, which, while it closely adheres to the shop and dry dock arrangements heretofore mentioned, corresponds more closely with the present water-front conditions of the yard; *i. e.*, the Ordnance Dock is retained. The length and depth of three slips from this Ordnance Dock to the East River is increased so that vessels will not overhang the end of the wharf at the prow or stern and be liable to accident by collision from passing craft. Two long slips are provided on the East River water-front to the west of the yard. The only objectionable feature of this plan is that it would be difficult to get vessels in or out of these slips, except with a condition of slack water in the East River. The plan has the advantage of less first cost, but its disadvantages, it is believed, more than outweigh this.

10. There is herewith given approximate estimate of cost of the suggestions contained in the six steps previously recited. It will be noted that this amount ($14,300,000) $1,862,500 is accounted for by the Hull Division shops and building slip, and $1,510,000 by storehouse and changes in the present storehouse to use it for the manufacture of clothing and storage of provisions. These two features can, of course, be eliminated from the plan if thought desirable. $5,500,000 is accounted for in the rebuilding of Dry Docks Nos. 2 and 3. It is understood that the rebuilding of these two docks is an inevitable necessity in the near future, if not exactly upon the lines laid down, upon some similar lines. The estimates for the docks, storehouse, Hull Division shops, together with the purchase of land perhaps of $1,200,000, amounts to

$10,072,500, leaving $4,227,500 remaining for the other impr
ments. Details are as follows:

FIRST INCREMENT.

SEE MAP PLATE NO. 1, ALSO STRUCTURAL DRAWING.

Standard gauge railroad track	$ 5,500	
Fabricating shed for C. & R. Dept., 350′ x 250′ x 100′ high, with transept 325′ x 100′ x 110′ high with mold loft	675,000	
Plate and shape furnaces, slabs, stack, etc.	20,000	
Equipment, cranes, etc.	50,000	
Dredging for extension of building ways No. 2	12,500	
Concrete and steel permanent ways	120,000	
Cart shed	2,000	
Rebuilding work on forge shop and steel foundry	25,000	
Required for public works, sewer, electric distribution, steam, salt and fresh water, air and telephone changes, etc.	50,000	
Crane shed over building ways, 160′ x 800′ x 200′ high 1 50-ton and two 10-ton cranes	960,000	
Dismounting and erecting cantilever crane in new position	18,000	
		$1,9

SECOND INCREMENT.

SEE MAP PLATE NO. 2, ALSO DESIGN FOR STOREHOUSE.

Standard-gauge railroad track	$ 3,500	
Crane track	6,500	
Fitting-up pier, 80′ wide, 650′ long	195,000	
Public works	50,000	
Storehouse for general storekeeper, 200′ x 550′, 8 floors	1,500,000	
Terminal car bridge and float guard	30,000	
Dredging basin to 35′ and removing Cob Dock	384,000	
		2,16

THIRD INCREMENT.

SEE MAP PLATE NO. 3.

Railroad and crane track	$ 30,000	
Lighter slip for steel stock yard	46,000	
Sea walls	96,000	
New Dry Dock No. 2, 140′ x 850′ x 35′ over sill	2,500,000	
Timber storage	50,000	
80,000 sq. ft. new piers	120,000	
Public works	100,000	
		2,942

FOURTH INCREMENT.

SEE MAP PLATE NO. 4.

Railroad and crane track	$ 30,000	
Dry Dock No. 3, 140′ x 1100′	3,000,000	
Public works	100,000	
		3,130,000

FIFTH INCREMENT.

SEE MAP PLATE NO. 5.

Railroad track	$ 10,000	
Piers and breakwater	800,000	
Sea wall	210,000	
Oil storage plant	100,000	
Coaling plant	300,000	
Public works	50,000	
Dredging	480,000	
Pattern storehouse	250,000	
		2,200,000

SIXTH INCREMENT.

SEE MAP PLATE NO. 6.

Purchase	$1,200,000	
Dredging	126,000	
Sea wall	222,000	
Retaining wall	200,000	
New residence for commandant	50,000	
Excavation	50,000	
Railroad track	31,000	
Fitting Building No. 126 for provision and clothing	10,000	
Public works	50,000	
		1,939,000
Total cost of improvements		$14,300,000

11. There is also submitted estimate of plan shown on Plate 9:

Standard-gauge railroad track	$ 65,000
Fabricating shed	675,000
Furnaces, slabs, stacks, etc.	20,000
Equipment of shed	50,000
Extension of building ways, dredging	12,500
Concrete and steel permanent ways	120,000
Cart shed	2,000
Rebuilding portion of forge shop and steel foundry	25,000
Public works	300,000
Crane shed over ways	960,000
tilever crane in stock yard	18,000
ting up pier	195,000

ience dictates, and, in fact, practically no part of the work is
ntingent upon any other part. Roughly speaking, the project
y be divided into the following parts:

First: Dry dock improvement.

Second: Water-front improvement.

Third: Storehouse improvement.

Fourth: Modern building for Hull Divisison work of manu-
cturing plant.

14. The bearing of the above remarks as to independence of ork items will be recognized as clearly applying to the first ree of the above divisions. As regards the fourth, we have not ne into detail, but we are prepared to outline a step-by-step ogram which could be adopted and which would allow the erecon of the " fabrication shed " without interfering materially with e orderly progress of current yard work; and unless the output of e yard with regard to new ships were increased to one ship a ar rather than one ship in two years, as at present, the new ilding slip arrangements could be carried out without interring with the building program.

15. We believe that the interest of the Government would be st served if the various steps in the rehabilitation of the yard indicated in sheets 1 to 6, inclusive, were appropriated for year y year, each yearly appropriation corresponding to the work dicated on the successive sheets.

16. A tabulation is herewith given for purposes of comarison, showing the lineal feet of berthing space, square feet of ier area, area of land, area of water, and area of docks of the avy yard in its existing condition, the navy yard as to be develped under the Rodgers Board plan, as developed under the lan proposed by Admiral Murdock and approved by the Departnent, and also plan herewith recommended, shown on Plate 6, nd the alternate plan shown on Plate 9. The pier area includes, esides the actual areas of wharves, area of quays, obtained by he linear feet of quay wall by a depth of 50 feet.

Map	Area land acres	Area water acres	Area dock acres	Total area acres	Berthing lin. ft.	Pier area sq. ft.
Yard at present..	120	69	5	194	10.635	426,500
Rodgers Board..	135	67	5	207	16,365	671.925
Admiral Murdock	112	77	5	194	14,400	565,000
Plate 6, plan rec..	111	85	9	207	23.750	948,500
Plan 9, alt. plan...	113	87	9	207	22.500	875,500

17. The entire area of the present property, including land and water, is 194 acres, and including the so-called Hudson purchase, 207 acres. It will be noted that the plan recommended herewith, shown on Plate 6, gives the maximum berthing space and pier area, being for the berthing space approximately 125 per cent in excess of that at present provided, 40 per cent in excess of the Rodgers Board, and nearly 60 per cent in excess of the plan proposed by Admiral Murdock. In general, the pier area shows the same increase over existing conditions and the two plans proposed and referred to herein.

18. The fact must not be overlooked that our primary intention is not to lay down in detail, or even in anything but on very broad lines, the development of the present site, but merely to show that it is both possible and practicable to develop the present yard, with a reasonable cost, into a most satisfactory, efficient, and comprehensive naval establishment for the repair, and if necessary the building, of vessels of war, with due regard to the fact that the New York Navy Yard has been in the past, and will probably continue to be in the future, the yard upon which the greatest demands are made in connection with the efficiency of the fleet.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NEW METHOD OF TEACHING SWIMMING, WITH A FEW HINTS ON RESCUING THE DROWNING.

By Midshipman Fitzhugh Green, U. S. Navy.

think that my first ambition was to become an expert swim- My ideal was the gold-fish that cruised about in his glass- ided sea. I have not quite realized that dream, but what ess I have had I owe to a burly life-guard whose livid skin inated my youthful eye as did his great guffaws my ear. n him I extracted a promise that I should learn to swim in lesson, and I did.

ne does not have great height at the age of seven, and when mountainous friend of mine carried me to water that crested own freckled shoulders, the sea might just as well have had ottom. But I trusted implicitly and thereby fulfilled the first irement of successful teaching, viz., the confidence of the l. He held me at arm's length:

Now sonny, take a big breath and don't wriggle so much as e."

ith my last lung full of air, as I thought, he put me upright e water. Down I sank, down, down, until I thought surely ould never stop. I think that I was still dropping when I d a familiar chuckle and opened my eyes to see that great face looking as though it were about to burst. At the same ent I realized that the water was just under my eyes and d not even smile.

hen I thought I must have air or strangle he reached under gave me a touch towards the surface. "Now blow," he ed, and I blew like a punctured balloon, just managing to another breath before I was down as at first. The next time gave me his hand I was terribly informed that if I wanted more air I must use my "flippers." I did not wait, but as

soon as he let go commenced to paddle with both hands. To my great amazement, at the first push, up bobbed my shoulders. In another minute I had discovered that my eyes would stay clear of the water without any move on my part; and, if I needed air, I had only to flap my hands to bring my nose and mouth well up. In bobbing up and down I ventured a kick and was somewhat terrified to feel my feet float up on a level with my head. Even in this position I found that I could bring my mouth up clear for a breath. I think that I imitated a side-wheeler, or it may have been a dog. At any rate I never remember a happier moment in my life than when I commenced to crawl with my arms and legs and discovered that I was making headway through the water. I had learned to swim in less than ten minutes!

My wonder at the ease with which I mastered this enchanting game has left every point of that brief lesson stamped indelibly upon my mind. That wonder was not lessened in after years when I saw men becoming swimmers at the rate of a dollar a lesson, nor after that when I saw some of these same swimmers half strangling in a small ground swell. What good to them was the fifty-yard qualification they had passed at the climax of their expensive instruction, if they could not even keep their breath when over the side? It were better to have learned to swim under the water than to drown on the surface!

During our first summer at the Naval Academy we were given the standard distance test. Those who failed were kept to the tank and given daily lessons in the "frog and scissors" kicks and the breast and side strokes. By prolonged paddling about, the boy succeeded in reaching the stage where he could wallow through fifty yards of *smooth water*. From that time he was known as a swimmer and believed himself one.

I am taking an average example when I consider this man on a ship, say at the Southern Drill Grounds where there is a two-knot current and the natural ground-swell cross-cut by a moderate breeze. Just before sundown everyone goes overboard, including our qualified swimmer. He comes up and in opening his mouth, for a breath manages to bite off the crest of a passing wavelet. Successful coughing requires air in the lungs and this involuntary expulsion is followed by a similar inspiration. More water inside is the logical result. Then this man who can swim

the breast and side strokes and cross a fifty-yard tank without effort, makes the sea ladder half-drowned, or is hauled in with a line. He has not been ten feet from the armor shelf! He could swim but could not breathe; the relative importance of the two is not difficult to understand. In ninety-nine cases out of a hundred, where a man has had such an experience, he loses all confidence that he has it in his ability to stay afloat and gives up deep-sea swimming for inshore bathing, where he is sure of his fifty yards and his scientific breast stroke.

I do not wish to insinuate that good swimmers make better officers or better men. But I do believe that through lack of proficiency in that art both officers and men are deprived not only of a great many healthy swims but of the desire for them; that an insignificant number of officers and men could lend assistance to a shipmate in trouble overboard, or stay up themselves for any length of time when a brisk sea was running; and that there are a great many instances where work over the side is improperly done through a man's involuntary realization of the dangerous possibilities if he accidentally slips his bowline. The lives of these men are unduly hazarded every time they risk a plunge, and even an unconscious appreciation of the fact detracts from the quality of their work.

As for the health-giving argument, athletics have gone hand-in-hand with other competition in developing our enlisted personnel. Marathon runners have trained for the greatest strain in athletics by taking three swims a week. Some of our high-speed stoking and the late target practices have been Marathonic in their demands upon nerve and muscle. Excepting this side of the proposition, it bears about the same relation to our daily routine that the Navy, considered as a fighting defense, does to the country's need in times of peace. Both have only perfunctory uses until the moment of need arrives; then their existence becomes vital.

For instance, in 1908 a man was washed overboard from the *New Jersey* in a China Sea typhoon. To launch a life-boat would have been suicidal, and no man on earth could have propelled himself through that awful maelstrom. But this man knew *how to breathe* in a choppy sea and calmly waited for his ship to heave to and throw him a line. He might have been an expert at the crawl and trudgeon, he might have been a distance

swimmer or a sprinter; but had he not known how to fill his lungs between seas his would have been a sad reminiscence.

This prolix digression is pardonable in its illumination of the fact that a human life is valuable for other than sentimental reasons. If, perchance, Ulysses S. Grant had been lost at sea at any time up to his twenty-eighth birthday, the bereaved wife would have received her modicum of condolence befitting the obscurity of her husband's existence. Suppose the accident to occur three years later and you must expand your imagery to include a nation as his stricken family. "A man's a man for a' that," and a seeming failure of a life may become more valuable to the country than the fleet itself. Carelessness of such possibilities is criminal selfishness. The drowning boy should always be saved for his mother's sake, but, if he is an embryo Grant, the mother-country is the one served.

Returning to the subject, I recall the reports sent north while the fleet was exercising in Guantanamo Bay. Scarcely a week passed without several hundred men qualifying as swimmers. My ship arrived late but was no less successful in turning out an amphibious crew. Just before leaving, a swimming meet was held. Little encouragement on the part of the officers resulted in an unexciting series of short races. Strange to say, the winners of events were almost without exception indifferent swimmers. I should approximate that less than 20 per cent of the participants could have made a ship's length in any sort of a sea. Three days later the fleet was ploughing through typical Hatteras boilers and very few life-buoys have ever been dropped at less than two hundred yards from the swimmer.

The officers are to blame. At present our race-boat crews are respected the world over, and they have matured only under the guidance and enthusiasm of those in a position to push their development. Why should the swimming instruction at Guantanamo equip a man only for duck-pond paddling when the resulting over-confidence is even more disastrous than none? Why not have a definite system? Enter it in the drill books along with setting-up exercises and the like. Promote contests and make their prizes worth while.

As an entering wedge, I suggest the following steps in teaching a man to swim:

1. Impress upon him that with the lungs full, or even par-

tially so, the body will float in salt water submerged to about the nose—the natural buoyancy varies with the amount of fatty tissue present. On this breath he can exist from forty-five seconds to two or three minutes, depending upon his lung capacity. Furthermore, the *slightest motion* of arms or legs in a downward direction will bring the mouth clear of the water. This breathing exercise can better be practiced in deep water; it is the fundamental step of the whole. Once the pupil has acquired the knack of filling up with air at the proper times, he has gained a confidence and self-possession that would do credit to an expert.

2. In the beginning all movements should be made slowly. This is in direct contradistinction to the usual fly-wheel movements that one associates with the antics of a beginner. It is fighting the water that drags a drowning man beneath the surface. He paddles as hard downwards as he does up and loses buoyant wind accordingly.

3. Use no particular stroke other than the natural paddling. The famous trudgeon and crawl and polo strokes are only economical adaptations of skill to this.

4. In swimming, always keep body and head parallel to the surface of the water, lifting the face and inhaling only when necessary. If the swimmer attempts to keep his head out of water the body will lie pointing towards the surface and offer considerable more resistance to ahead motion than when lying in the plane of its surface.

5. Observe temperance in duration, distance, speed, and all other circumstances attendant upon the exercise.

NOTES ON RESCUING THE DROWNING.

It has been estimated that 44 per cent of accidental drowning is the result of one swimmer improperly assisting another in trouble. When a person becomes panic-stricken in the water he fights in a frenzy of fear. The churning of his arms and legs results in forcing his body below the surface because he naturally makes all up-strokes quicker than those down; that is, his actions are analogous to a man slipping down a steep incline who grips quickly for a new finger hold each time his last one escapes from the tense fingers. The unusual exertions cause quick inhalations and consequent strangling.

The strength of fear cannot be measured by a man's physical appearance, for it depends upon his nervous fabric. Hence a small man will often drag down his more muscular rescuer.

There are several main points that govern in such emergencies:

1. There is always time to divest oneself of coat and shoes. A man will not go down for the last time in less than three minutes, as a rule.

2. Always dive rather than jump into the water. A dive will carry one further in the desired direction and a better position for action is had upon reaching the surface.

3. Approach the man cautiously, talking to him in the hope of quieting his perturbation.

4. Wait until he is reasonable or pretty nearly gone, then make for a hold.

5. Obtain this hold from the rear, making him turn by dashing water into his face; or by employing the old water-polo trick in which the opponent's wrist is grasped with one hand jerking him forward while the body is ducked under and behind him by placing the other hand in his armpit. The proper hold is facing his back with both hands upon his chin and head. If the thumb be pressed firmly upon the nerve just under his ear it will prevent further struggling.

6. His legs must be avoided, as their grip is more powerful than that of the arms. To keep away give him an occasional push in his back with either foot.

7. Keep under water as much as possible, since the buoyancy of one body will help support the other.

I have had several unpleasant experiences of this kind and can vouch for the applicability of these methods.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ON WEDDLE'S RULE, AND SOME NEW APPROXIMATE FORMULÆ FOR AREAS.

By W. WOOLSEY JOHNSON.

1. In a paper, published in these PROCEEDINGS, Vol. 35, p. 759, I presented some tests of Simpson's Rules and other cases of Cotes's Rules for approximate areas, together with the rule which was introduced by Thomas Weddle, as a modification of Cotes's Rule for the case of six intervals. I have since found a new basis for Weddle's Rule, and in consequence been led to some new rules of analogous formation.

2. In the preceding paper, to which reference will be frequently made in what follows, it was noticed that Simpson's "First" and "Second" Rules (which are Cotes's Rules for $n=2$ and $n=3$), are both exact for the parabolic curve of the third degree, so that their errors when the curve is of higher degree may be said to be of the same order; and also that the same thing is always true in the case of an even and the next higher odd value of n. Thus Professor Asaph Hall, writing in the *Analyst* in 1876, Vol. 3, p. 5, says: "There is a peculiarity in the approximation by Cotes's method. It is that in passing from an odd number of ordinates [even number of intervals] to an even number, the degree of the error of the quadrature does not change, although its amount is diminished, but when we pass from an even number to an odd number, the error is diminished two degrees."

The diminution of the amount of error referred to above is, however, due solely to the fact that more measured ordinates are used; for, in the case of six intervals, where the same measured ordinates may be used in comparing the rules for two and for three intervals, we find, as was shown by Merrifield (see p. 763), that the amount of error is actually less for the case $n=2$ than for the case $n=3$.

3. Denoting the values assigned by the two rules to the mean ordinate by y'' and y''' respectively, the equations determining them are

$$18y''=y_1+4y_2+2y_3+4y_4+2y_5+4y_6+y_7 \qquad (1)$$

and

$$16y'''=y_1+3y_2+3y_3+2y_4+3y_5+3y_6+y_7. \qquad (2)$$

The comparison made by Merrifield was between these values and that of y^{vi}, determined by Cotes's Rule for $n=6$. The ordinates being expressed in terms of their differences, he found the discrepancy to begin, in each case, with the term involving $\Delta^4 y$,[1] and that their amounts (which, of course, constitute the principal parts of the errors) were in the ratio 4 : 9.

4. The comparison, in this and similar cases, can equally well be made by means of the value of y assumed as a power series in x, say

$$y=a_0+a_1x+a_2x^2+\ \ldots\ +a_nx^n+\ \ldots$$

For this purpose, it is convenient to take the origin at the middle point of the base. Since the limits of the integral $\int y dx$, representing the area, are thus made numerically equal with opposite signs, the odd-numbered coefficients, a_1, a_3, etc., will vanish from the result of integration. They will also vanish from the sums of ordinates equidistant from the origin, of which sums the several rules are made up. Thus the errors contain the coefficients of even powers of x only, these coefficients defining the order or "degree of error" referred to in the quotation above from Professor Hall.

5. The result of comparison, in the present case, is that the errors in y'' and y''', as given by equations (1) and (2), both appear first as a term containing a_4, that they have the same sign, and are in the ratio 4 : 9, as otherwise found by Merrifield.

It follows that the expression $9y''-4y'''$ will be without error in a_4; so that, if we put

$$9y''-4y'''=5Y,$$

Y will be a mean value of the ordinate which is free from error in a_4, that is to say, of which the error will be of the order a_6.

[1] This was by mistake printed $\Delta^6 y$ in the previous paper, Vol. 35, p. 763.

Since the relation between Y, y'' and y''' may be written in the form

$$2(18y'') - 16y''' = 20Y,$$

it appears that the coefficients of the ordinates $y_1, \ldots y_7$ in the value of $20Y$ may be found by doubling those in equation (1) and subtracting the corresponding ones in equation (2).

The resulting coefficients are

$$1, 5, 1, 6, 1, 5, 1,$$

which are, in fact, the multipliers used in Weddle's Rule.

Weddle's Rule may thus be based absolutely upon Cotes's Rules for $n=2$ and $n=3$,[2] instead of being regarded as an approximation to Cotes's Rule for $n=6$.

6. The next case in which a similar, so to speak, ***composite*** rule can be derived from two Cotesian Rules by the elimination of errors of the same order results from the rules for $n=4$ and $n=5$, in both of which the first term of the error involves a_6.

Suppose then that the measured ordinates divide the base into 20 equal intervals, so that we may make five applications of the Cotesian Rule for $n=4$, or four applications of that for $n=5$. In determining the mean ordinate the common interval may be assumed as the unit. Then the mean ordinate determined by integration is

$$\bar{y} = a_0 + \tfrac{1}{3} \cdot 10^2 a_2 + \tfrac{1}{5} \cdot 10^4 a_4 + \tfrac{1}{7} \cdot 10^6 a_6 + \ldots$$

According to the Cotesian Rules (see p. 760), the multipliers in the two cases (carried so far as the middle ordinates) are:

For y^{iv}: 7, 32, 12, 32, 14, 32, 12, 32, 14, 32, |12|, etc.

For y^{v} : 19, 75, 50, 50, 75, 38, 75, 50, 50, 75, |38|, etc.

The aggregates, when the values of the ordinates are introduced, are the values of $450y^{iv}$ and $1152y^{v}$ respectively. On comparison with $\bar{y}$, the first terms of the errors of y^{iv} and y^{v} are found to be, $\frac{32a_6}{21}$ and $\frac{275a_6}{84}$. These errors are in the ratio 128 : 275 (the advantage being, as in the case of y'' and y''', in favor of the even numbered rule).

[2] The relation between the three sets of multipliers in these rules was first pointed out to me by Professor W. S. Harshman.

It follows that the errors of $450y^{iv}$ and $1152y^{v}$ are in the ratio 2 : 11. Hence, if we put

$$11(450y^{iv}) - 2(1152y^{v}) = 2646Y_{4\,5},$$

$Y_{4\,5}$ will be a mean value of y free from error in a_6; that is to say, one of which the error is of the order a_8. This equation shows that the multipliers for this new mean value are found by taking 11 times those for y^{iv} and subtracting the doubles of those for y^{v}. Hence the multipliers for $Y_{4\,5}$ are found to be

39, 202, 32, 252, 4, 276, − 18, 252, 54, 202, |56|, etc.

7. It is readily verified by direct substitution that the terms in a_6 vanishes from the error when these multipliers are used. I have derived the Cotesian numbers for $n = 20$, and it is noteworthy that (unlike the case of Weddle's Rule) the ratios of the numbers obtained above bear no resemblance to the corresponding ratios in the complete rule.[3]

8. The multipliers in the rule for $Y_{4\,5}$ given above are, like those in the higher Cotesian Rules, inconveniently large for practical purposes. I have, however, succeeded in finding, by a similar process, a practicable rule for the case of twelve intervals.

As stated above, the error in Weddle's mean ordinate (which may be denoted by $Y_{2\,3}$) is of the order a_6; but this is also the error of y^{iv}, the result of Cotes's Rule for $n = 4$. These rules admit of direct comparison when twelve intervals are used; hence, when this is done, their errors of order a_6 may be eliminated, and a composite rule found for a new mean value which may be designated by $Y_{2\,3\,4}$.

9. For twelve intervals the mean ordinate determined by integration is

$$\bar{y} = a_0 + \tfrac{1}{3}\cdot 6^2 a_2 + \tfrac{1}{5}\cdot 6^4 a_4 + \tfrac{1}{7}\cdot 6^6 a_6 + \ldots$$

The multipliers in the two cases now to be compared are:

For $Y_{2\,3}$: 1, 5, 1, 6, 1, 5, |2|, 5, 1, 6, 1, 5, 1.

For y^{iv}: 7, 32, 12, 32, 14, 32, |12|, 32, 14, 32, 12, 32, 7.

[3] On making a test similar to the "*Third Test*" of the previous paper (p. 766), the true value being $\log_e 2$, I found for the error of y^{iv}, 370; of y^{v}, 706; and of $Y_{4\,5}$, 17, all in the 11th decimal place. The error of the Cotes Rule, or y^{xx}, which is of the order a_{22}, was found to be —43 in the 17th decimal place. Of course, the superior accuracy shown in these tests as compared with those previously given for y'' y''' and $Y_{2\,3}$, is partly due to the greater number of measured ordinates used.

The first of these lines represents an aggregate of ordinates equal to $40Y_{2\,3}$, and the second, an aggregate equal to $270y^{iv}$. On substituting the values of the ordinates, the first of these aggregates will be found to exceed $40\bar{y}$ by $\frac{240a_8}{7}$, and the second to exceed $270\bar{y}$ by $\frac{2880a_8}{7}$. These errors are in the ratio 1 : 12.[4] Hence if we put

$$12(40Y_{2\,3}) - 270y^{iv} = 210Y,$$

we shall have the new mean value of which the error is of the order a_8. The multipliers for this value are therefore found by subtracting the numbers in the second line above from twelve times the corresponding numbers in the first line. The resulting multipliers are

$$5, 28, 0, 40, -2, 28, |12|, 28, -2, 40, 0, 28, 5.^{5}$$

10. A number of circumstances conspire to render this rule for $210Y$ capable of simple expression and application. For this purpose it will be convenient to denote the measured ordinates by $y_0, y_1, \ldots y_{12}$; and then, removing y_0, to replace y_{12} by the arithmetical mean $\frac{1}{2}(y_0+y_{12})$. We then have 10 for the multiplier of y_{12}, and the rule contains but five distinct multipliers, namely, 28, 40, -2, 12, and 10. Furthermore, since $40=28+12$, and $10=12-2$, they may be reduced to the three numbers 28, 12, and -2, each of which will thus be the coefficient of a certain sum of ordinates. The first of these sums consists of all the odd-numbered ordinates: the second, of those whose indices are multiples of 3; and the third, of those whose indices are divisible by 4. Denoting these sums by A, C, and D respectively, we have

$$210Y = 28A + 12C - 2D,$$

where $A=\Sigma y_{2r-1}$, $C=\Sigma y_{3r}$, and $D=\Sigma y_{4r}$.

[4] The errors in the values of $Y_{2\,3}$ and y^{iv} are therefore in the ratio 9 : 16; so that Weddle's Rule is more accurate than Cotes's Rule for $n=4$. When tested, as in the preceding note, by the computation of $\log_e 2$, the errors were found to be:— for Weddle's Rule 427, and for y^{iv}, 729 in the 10th decimal place.

[5] I have compared the error in a_8 of this rule with the like error of a double application of Cotes's Rule for $n=6$, and find the errors to be in the ratio 4 : 9, in favor of the new rule. Accordingly, the errors in the test with log 2 were 40 and 83 respectively in the tenth decimal place. A rule derived by the elimination of the error in a_8 further reduced the error to 4 in the tenth place.

Finally, putting this equation in the most convenient form for calculation, we have

$$Y=\tfrac{1}{5}\left\{\tfrac{2}{3}A+\frac{2C-\tfrac{1}{3}D}{7}\right\}$$

for the mean ordinate, and for the area the product Yb where b is the base.

11. When the number of intervals is a multiple of 12 a repetition of the rule gives 10 as the multiplier of y_{12}, y_{24}, etc., and it will only be necessary to put the arithmetical mean of the extreme ordinates in place of the final one, in forming the sums C and D. The formula will then give the sum of the mean ordinates in the several divisions and we shall still have

$$\text{Area}=\frac{b}{5}\left\{\tfrac{2}{3}A+\frac{2C-\tfrac{1}{3}D}{7}\right\},$$

where b is the base of one division of the area, or twelve times the common interval between the ordinates.

Putting h for this common interval we may finally write

$$\text{Area}=\frac{4h}{5}\left\{2A+\frac{6C-D}{7}\right\}.$$

It may be noticed that, using the same device with regard to the extreme ordinates, and putting $B=\Sigma y_{2r}$, the sum of the even numbered ordinates, Weddle's Rule becomes

$$\text{Area}=\frac{3h}{10}(5A+B+C).$$

The present rule involves but little more labor, and should exceed Weddle's Rule in accuracy as much as the latter exceeds Simpson's first rule.

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THE FUNDAMENTALS OF NAVAL TACTICS.

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INTRODUCTION.

The study of naval tactics has for its object the employment of ships in battle. This does not mean that the field of such inquiry is limited simply to that in which the weapons are in action (offensive contact); indeed it is well understood that, directly in relation to the battle, the movements of the two adversaries from the time of their sighting each other are to be considered; furthermore, on the information obtained from the units that keep the enemy in sight, the remainder of the forces can be arranged in the most opportune way for its tactical employment. Therefore, under the head of *tactical contact,* besides the above-mentioned form (offensive contact), it is well to include also that of *contact out of range.*

To proceed from the simple to the complex, let us examine successively:

I. *The elements of maneuvering;* seeking to establish the importance of the various elements (angles and distances) by means of the examination of the *momentary tactical situations;* considering the mobility of the adversaries only in so far as it affects the probability of hitting with the weapons.

II. *Maneuvering;* examining how, by its effect, the tactical situation may be subjected to change.

III. *Tactical action as a whole,* on the basis of the above-mentioned parts, completing the picture of the battle which results from them.

One may find a certain reluctance in admitting the convenience of studying the momentary situation apart from the maneuvering, but it is necessary to consider that if the study of the movement is put first, it would appear to be necessary to leave the other out.

PART I.

THE ELEMENTS OF MANEUVERING.

CHAPTER I.

DIRECTIONS OF MAXIMUM UTILIZATION.

1. *Definitions.*—We call *long-range combat* that which is developed within the limits of distance which permit the use of guns only.

By the *polar bearing* of a point is meant the angle that the line joining the center of the ship with that point makes with one of the principal directions of the ship (direction of the bow, or of the stern, or of the beam).

The polar bearing of a ship that is being fired upon is also called the *inclination to the plane of fire.*

2. *Sectors of Maximum Offense.*—Let us examine the manner in which the offensive power of a ship varies with the variation of the inclination to the plane of fire.

First of all, let us suppose that the ship under consideration is armed with guns of a single caliber.

By taking into account the fields of fire, the number of the guns that fire in the different directions is determined. The variations of the offensive power may usefully be represented by means of a polar diagram, whereon the principal directions of the ship are traced, and whereon, for every inclination, the radius vector has a length proportional to the number of guns that can fire in that direction.

The offensive field may not be uniform.

The first monitor had two dismountable smoke-stacks; and so the armament, enclosed in a single revolving turret, had a field of fire of 360°.

A type of ship that could satisfy such requirements would secure to the single guns the maximum utilization; but if we establish it as an axiom to consider every ship as an organic unit unit of the fleet, and then seek to obtain the maximum return from the whole organization, we must admit the necessity of having the

same kind of guns on every ship. This being the case, in order that the offensive field might be uniform, it would be necessary, ideally, to have a number of guns on a circumference, each gun with a field of fire of 180°. The number of the guns being practically limited, there follows the possibility of having some of the guns with a greater field of fire than the one just mentioned, which involves the necessity of the offensive field having its maximums and its minimums.

When long-range combat was held to be only a transitory phase of the action, it was drawn therefrom as a corollary that the maneuvering should be independent of the employment of the guns; therefore it was sought to approximate to a circular arrangement, securing the development of the maximum offensive power in the principal directions of the ship. Thus there was designed for the heavy guns an arrangement on a diagonal (Duilio), and in a lozenge, adopted by the French. Thus, also, disposing a battery of medium guns about the sides of a lozenge, given the fact that each gun may fire very close to another situated further inboard, we may say that the above-mentioned object is attained. With arrangements of this nature, if, starting from the beam of the ship, we consider the offensive power developed in the various directions, we find that the maximum power is developed up to a certain angle from the beam; beyond this limit, the power falls to a minimum, it becoming possible to fire only with the guns in one quadrant, until, in the direction of the keel—since there the guns of the other side enter also into action—we have again the maximum offensive potentiality. Thus we have, laterally, sectors of maximum offense and sectors of minimum offense; in the direction of the keel we have a *direction* of maximum offense, but not a *sector*.

At present the power of the artillery compels us to consider the long-range combat as a most important form of action, in which it is necessary to subordinate the maneuvering to the good employment of the guns, without, however, creating too difficult conditions for the maneuvering. From this principle we immediately derive the consequence that simple *directions* of maximum offense badly satisfy the tactical necessities. It is then necessary to direct the mind not so much to the importance of uniformity in the offensive field, as to securing for this field the maximum intensity where most convenient. On this basis it must be re-

membered that, in every discussion of the distribution of the offensive power, the amplitude of the fields of fire of the single guns must serve as basic data only; the important thing is the manner in which the various fields of fire blend together.

Since ships are longer than they are broad, the maximum number of guns can be placed along its length; in such case the result of the distribution of the offensive power still remains, as already mentioned; or, from sectors of maximum offense we pass to those of minimum offense, with a new increase of power when we reach the line of the keel; however, the power in the latter direction is inferior to the maximum. The nearer we approach the arrangement of all the guns on the longitudinal axis, the more we increase the said inferiority, and at the same time we increase the amplitude of the sectors of maximum offense; and, reciprocally, the greater the similarity between the power in line with the keel and that of the sectors of maximum offense, the smaller is the amplitude of the said sectors.

When the armament is composed of guns of different calibers, in order to establish the elements of the distribution of the offensive power that are important in long-range combat, it is evidently necessary to proceed in the following manner: (1) Exclude the guns that are inefficacious in the said form of action; thus, for instance, in battle between armored ships, only the guns above a caliber of about 15 centimeters are to be considered. (2) Determine the sectors of maximum and minimum offense for the calibers that are useful in long-range battle in the manner above mentioned. (3) Observe how the sectors of the various calibers intermingle.

Rigorously, we should hold to be sectors of maximum offense of the ship all those common to the sectors of maximum offense of the various calibers. Their amplitude would hence be determined by the caliber having the most limited sectors; however, it is easy to understand how the amplitude in question may be considered as increased when we take into account the relative importance of the different parts of the armament. In long-range battle the maximum caliber has predominating importance; hence it is its distribution that should essentially be considered. Ordinarily, in the interval between the extremes of the sectors of maximum offense of the maximum caliber, and those of the sectors in which we have, absolutely speaking, the maximum of

power, the variation may be held to be negligible. More in general, by considering the importance that each kind of gun has in the composition of the armament, it will be easy to establish what caliber shall determine the amplitude of the sectors of maximum offense which it will be well to take as the standard in tactical employment.

The search for the best disposition of the guns forms no part of the study of tactics, although it is of consequence to it; for this reason we confine ourselves to simple statements concerning the manner in which the offensive field is distributed in the existing types of ships.

Generally the offensive field is symmetrical with respect to the longitudinal axis * and to the transverse axis.

Dissymmetry with respect to the beam would be advisable whenever we might, with reason, establish a greater probability of fighting with the enemy bearing forward of the beam than abaft the beam, or vice versa; for the present we confine ourselves to noting that we may not exclude the convenience of keeping the enemy abaft the beam, when this is not done in order to avoid action.

In general, between two scouting vessels, one will be interested in bringing about an action, and the other in avoiding it; the tactical maneuvers will thus assume the form of a pursuit. It is not simply a question, as above indicated, of keeping the enemy forward of or abaft the beam, with the object of causing the tactical action to assume the form that we desire, but, more properly, it is a question of chasing or being chased; hence the power of the fire in the direction of the keel will have greater importance than in the types of ships not destined for detached service; this explains why, in the light ships, we seek to obtain directions of maximum offense in line with the keel.

* A dissymmetry with respect to the longitudinal axis would obtain, for example, with two turrets arranged, one on the starboard side and the other on the port side, very near to each other, with their centers in a direction inclined to the said axis, when the guns of one turret are higher than those of the other, so as to permit firing over them; dispositions of this nature would oblige us to present to the enemy a definite side. The study of tactical maneuvering will show us how harmful this limitation may be. (Author's note.)

The types of armored vessels that at present compose the fleet can, on the basis of their armaments, be grouped in the following categories:

(1) *Antiquated ships*, in which the sectors of maximum offense extend about 30° forward of, and about the same distance abaft, the beam.

(2) *Modern ships* (not specially constructed for longe-range battle). In these ships the distribution of the fire is about as follows: (a) Maximum intensity in a restricted sector in the vicinity of the beam. (b) Intensity a little inferior to the maximum, and practically to be considered as maximum, in the sectors of 45°-50° forward of and abaft the beam. (c) Minimum intensity in the sectors between the direction of the keel and 45° from the beam. (d) Strong intensity in line with the keel.

(3) *The most modern ships*, that, by the disposition of their armaments, may be divided into two categories: (a) Those with turrets on the longitudinal axis and on the sides, or with a part of them on the axis and a part of them removed therefrom; the sectors of maximum offense, with an amplitude of about 45° forward of, and 45° abaft, the beam, as in the modern ships. (b) With all the turrets on the longitudinal axis; the sectors of maximum offense extend to 55° or 60° forward and abaft, and, as a maximum limit, to 70°.

In the discussion of tactical employment it is therefore necessary to take as a basis the following data: The amplitude of the sectors of maximum offense, in the generality of present-day vessels, is from 45° to 50° forward of and abaft the beam. In some ships this amplitude is 30°, and in others it is 60° forward of and abaft the beam.

3. *Inclination and the Probability of Being Hit.*—Within the limits thus determined for the sectors of maximum offense, we propose to estimate the influence that the inclination of the ship to the plane of fire (which we will count from the beam) has upon the percentage of effective hits made by the enemy.

We may hold, approximately, that the target presented by our ship has a certain uniform height q above the sea, and that its horizontal section is an ellipse, with its axes respectively equal to the length L, and to the maximum breadth l of the ship itself.

Let $PTP'T'$ (Fig. 1) be the section corresponding to the waterline; PP' and TT' being respectively the longitudinal axis and

the transverse axis. If $TON = \psi$ is the inclination to the plane of fire, by projecting on the sea the contour of the upper section of the target, in the direction of the trajectories of all the shots that would touch that upper section, we delineate on the surface of the sea another ellipse which may be held to be identical with the first. The corresponding points of the two ellipses are distant

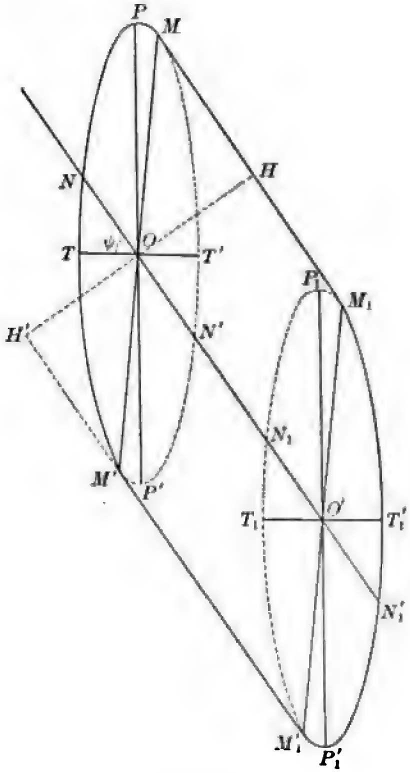

FIG. 1.

from each other $\frac{q}{\tan \omega}$, ω being the angle of fall of the projectiles. If MM_1 and $M'M'_1$ are the traces of the planes tangent to the target, drawn parallel to NO, the thin, fictitious, horizontal target, to which we may refer for the question we are discussing, is limited by the portion MNM' of the water-line, by the two segments MM_1 and $M'M'_1$, and by the remaining portion of the ellipse $M_1N'_1M'_1$.

Indicating by $A\psi$ the depth NN'_1 of the fictitious target in the direction of the plane of fire, by the known properties of the ellipse * we have

$$A\psi = NN' + \frac{q}{\tan\omega} = \frac{Ll}{\lambda} + \frac{q}{\tan\omega},$$

making

$$\lambda = \sqrt{l^2 \sin^2\psi + L^2 \cos^2\psi}.$$

The surface $S\psi$ of the fictitious target is given by

$$S\psi = \frac{\pi}{4} Ll + \frac{q}{\tan\omega}\lambda.$$

In regard to the probabilities of hitting, the above-mentioned fictitious target may be replaced approximately by a rectangle with a depth $A\psi$ and a breadth $B\psi$, $B\psi$ being equal to $\frac{S\psi}{A\psi}$.

The probability $p\psi$ of hitting is given by

$$p\psi = p\left(\frac{A\psi}{Ex}\right) p\left(\frac{B\psi}{Ez}\right),$$

Ex and Ez being respectively the longitudinal and lateral stretches in which are included 50 per cent of the shots, and p being taken from the table of the factors of probabilities,† entering the table with the factors $\frac{A\psi}{Ex}$ and $\frac{B\psi}{Ez}$.

* In the equation of the ellipse which has for its axes L and l, substituting for x and y the projections of ON respectively on OP and OT, we deduce

$$NN' = \frac{Ll}{\lambda}. \qquad \text{(a)}$$

The surface $S\psi$ of the thin fictitious target is given by the area of the aforesaid ellipse, and by that of the parallelogram $MM'M_1M_1'$, which is $\frac{q}{\tan\omega} HH'$; HH' being the projection of MM' normally to the plane of fire. The value of HH' is determined as follows:

The area of the parallelogram, which has for its medians two conjugate diameters, is constant and equal to Ll; on the other hand, the area of the parallelogram, which has for medians NN' and MM', is given by $\overline{NN', HH'}$; hence $\overline{NN', HH'} = Ll$; and by equation (a) we find $HH' = \lambda$. (Author's note.)

† With what has been said in this and in the following chapter relative to the probabilities of hitting, it is well to record the following definitions:

The mean of the absolute values of the misses or deviations in a certain direction is called the *mean miss or deviation* in that direction.

The mean deviation, multiplied by the coefficient 1.69, gives the corresponding dimension of the *stretch that includes 50 per cent of the shots.*

If p_0, A_0 and B_0 are respectively the values of $p\psi$, $A\psi$ and $B\psi$ for $\psi=0$ (that is, with the ship placed normally to the plane of fire), making

$$K\psi=\frac{p\psi}{p_0}, \quad K'\psi=\frac{p\left(\frac{A\psi}{Ex}\right)}{p\left(\frac{A_0}{Ex}\right)}, \quad K''\psi=\frac{p\left(\frac{B\psi}{Ez}\right)}{p\left(\frac{B_0}{Ez}\right)},$$

we obtain

$$K\psi=K'\psi K''\psi.$$

For a battle we may not attribute to the 50 per cent stretches the values that are taken from the range tables, but we may establish rational limits that include the values of p. This being the case we note that by entering the table of factors of probabilities with a value $p\left(\frac{A_0}{Ex}\right)$, we may obtain therefrom $\frac{A_0}{Ex}$, which, multiplied by $\frac{A\psi}{A_0}$, gives us $\frac{A\psi}{Ex}$; with this argument, we obtain from the table above mentioned, p $\left(\frac{A\psi}{Ex}\right)$, which, divided by $p\left(\frac{A_0}{Ex}\right)$, gives us a value of $K'\psi$. We obtain $K''\psi$ by an analogous operation.

The values of $\frac{A\psi}{A_0}$ and $\frac{B\psi}{B_0}$ are functions of ω. Rigorously, for applying the indicated process, we ought to know the distances corresponding to the considered values of $p\left(\frac{A_0}{Ex}\right)$ and $p\left(\frac{B_0}{Ez}\right)$; however, this is not necessary because, within the limits between which ω may oscillate, for the various kinds of guns, in long-range battle, we find practically that the variations of $\frac{A\psi}{A_0}$ and $\frac{B\psi}{B_0}$ are restricted in such fashion that we may assume for

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The mean deviation multiplied by the coefficient 1.69 : 2 = 0.845, gives the corresponding probable mean error, which is greater than one-half of the errors and less than the other half.

The mean probable error produced by the simultaneous action of sundry independent causes is given by the square root of the sum of the squares of the mean probable errors. (Author's note.)

these quantities a mean value for every value of ψ within the limits of 0° and 70°.

Such being the case, for a ship that has the dimensions

$$L=150 \text{ meters}, \quad l=25 \text{ meters}, \quad q=8 \text{ meters},$$

supposing that the probability of direct hits in long-range battle may vary between 10 per cent and 50 per cent, we obtain for these limits the following

VALUES OF $K'\psi$.

Probabilities.

ψ	10 per cent.	50 per cent.	Mean.
0°	1	1	1
30°	1	1	1
45°	1.10	1.10	1.1
60°	1.25	1.18	1.2
70°	1.60	1.46	1.5

As is seen, the values of $K'\psi$ corresponding to the two limits of probability are about equal; we may therefore consider their mean.

For the supposed dimensions of the ship, the above values of $K'\psi$ express also the values of $K\psi$, within the limits of distance in which the width of the target is so much superior to that of Ez as to enable us to hold $K''\psi=1$.

When $B_0=4Ez$ (that is to say, when there is a probability of 1 with respect to the ship that presents her beam) we obtain the values of $K''\psi$ indicated in the following table; and hence, multiplying the values of $K''\psi$ by the corresponding values of $K'\psi$, we have the values of $K\psi$.

ψ	$K''\psi$	$K\psi$
0°	1	1
30°	1	1
45°	0.9	1
60°	0.8	1
70°	0.6	0.9

At the greatest distances an important lateral dispersion is inevitable. Under the not exaggerated hypothesis that out of 100 shots we may have 80 good in direction, we obtain

ψ	$K''\psi$	$K\psi$
0°	1	1
30°	0.9	0.9
45°	0.8	0.9
60°	0.6	0.7
70°	0.4	0.6

Hence we draw the following deductions:

(1) Within the limits of distance in which there is certainty that all the shots will be good in direction, the probability that the ship will be hit increases almost insensibly with ψ varying from $0°$ to $45°$, and afterwards it increases rapidly.

(2) Within the limits of distance in which the above-mentioned certainty is had only when the ship presents her beam, the directions included in the sectors of maximum offense are unimportant in so far as the probability of the ship being hit is concerned.

(3) At the greatest distances, the directions that are not removed more than $45°$ from the beam may still be considered unimportant with respect to the probability of the ship being hit; this probability undergoes a notable diminution at the extreme limits of the sectors of maximum offense of ships with all the heavy guns located on the longitudinal axis.

It is moreover to be noted that, in the hypothesis that for $\omega=10°$, we have $p\left(\frac{A_0}{Ex}\right)_1=10$ per cent, $p\left(\frac{B_0}{Ez}\right)=80$ per cent, for $\psi=90°$, or when the ship presents herself end on, we have $K'\psi=2.6$, $K''\psi=0.2$; and hence, $K\psi=0.5$; which, compared with the other values of $K\psi$ already calculated, shows that, *at the maximum fighting distances, a ship that presents herself end on, diminishes in that way the percentage of the enemy's effective hits.*

The preceding deductions avail for the hypotheses that may be made concerning the dimensions of battleships.

4. *Inclination and Protection.*—When it is said that a certain gun is capable of perforating a given thickness of vertical armor at a given distance, it is with reference to the hypothesis that the projectile arrives in a horizontal direction, normally to the plate, and that the latter is exactly vertical. As is well known, in battle, in the most favorable case for the gun, that is, when the plane of fire is normal to the plate, the conditions differ from those above stated for the following principal reasons: (1) The divergence of the axis of the projectile (supposed to be coincident with the direction of movement) from the normal to the plate, owing to the angle of fall and to the oscillatory movement of the target. (2) The divergence of the axis of the projectile from the direction of its movement. (3) The elasticity of the entire hull, which forms one body with the armor. We deduce from this that, in battle, a plate normal to the plane of fire is capable of resisting a

projectile that, with the same velocity of impact, would perforate it under the conditions of trial at the proving grounds. With reference to the battle, the hypothesis that the projectile arrives horizontally, with its axis coincident with the direction of movement, may then be taken into consideration; observing, however, that the results that are deduced therefrom have reference to limit conditions of efficacy of the projectile, that is to say, to ideal conditions, not attainable.

This being understood, if, under the proving ground conditions, and with the plane of fire normal to the plate, a projectile animated by a velocity of impact v is capable of perforating a thickness of armor s, on the other hand, when the plane of fire is inclined to the normal by an angle, ψ, the perforable thickness is s_t, less than s; and this does not depend solely upon the fact that there is disposed normally to the plate only a component of the velocity, but also upon the greater distance that the projectile must travel in the plate itself. This being the case, we may hold that the conditions of oblique impact are equivalent to those of normal impact with a velocity of impact $v \cos h\psi$, where h is an opportune coefficient.

Applying the De Märre formula for perforation successively to the case of normal impact and to that of oblique impact, and indicating by F the product of the terms of said formula, independently of the thickness of the plate and of the velocity of impact, we have

$$v = Fs^{0.7},$$
$$v = \cos h\psi = Fs_t^{0.7};$$

and hence

$$s_t = s(\cos h\psi)^{\frac{1}{0.7}}.$$

In order to establish the value of h, let us note first of all that, concerning oblique fire, the data are scant and the formulas are uncertain. It appears to be proved that the cap of the projectile may have among its advantages that of approaching the axis of the projectile to the normal to the plate; and hence, for moderate values of ψ, it seems that we may hold $h=1$. With the increase of ψ (that is to say, when the obliquity of fire is greater), the efficacy of the cap diminishes, and the perforable thickness s_t is less than that obtained by making $h=1$. Consequently *it is logical to admit that h may be a function of ψ.* For $\psi=60°$ the rebounding of the projectile is realized (when the thickness of

the plate is not excessively small with respect to their caliber), and hence $v \cos(h\, 60°) = 0$; from which $h = 1.5$.

Admitting that h varies proportionally from the value of $h = 1$, which corresponds to $\psi = 0$, to the value $h = 1.5$, corresponding to $\psi = 60°$, we obtain with the formula above mentioned the following table:

ψ	$\frac{s_i}{s}$
10°	0.98
20°	0.88
30°	0.72
40°	0.49
45°	0.35

If the values of s refer to limit conditions of efficacy of the projectile, the same may be said for the corresponding values of s_i; in other terms, as the thickness s—which, with a certain velocity of impact, is perforable on the proving ground—is more than sufficient to prevent penetration during battle, analogously, for an obliquity ψ the same result is obtained with a thickness s_i whose ratio with s is about that indicated in the table.

This shows the desirability of presenting the armor obliquely to the fire. Bearing in mind the perforating capacity of modern heavy guns, on the basis of the results above set forth—although we are far from pretending that they are rigorously exact—we may affirm that, for a ship which has on its sides armor of a thickness of 150 millimeters or greater, there are directions included in the sectors of maximum offense from which the armor cannot be pierced.

Let us suppose the case that we have on the sides a uniform thickness of armor not less than 150 millimeters. *The direction nearest the beam in which the side is invulnerable to the enemy's most powerful gun,* while it permits the development of the maximum offensive power, is that to which, with regard to the armor, the maximum defensive capacity corresponds; indeed, in the directions nearer to the beam the perforation of the side is possible. By approaching further toward the longitudinal axis the effects of the enemy's fire increase—it becomes an enfilading fire.

In the case of different thicknesses of armor, *the defensive capacity is maximum when the enemy bears in the direction nearest the beam in which the vulnerability of the side is minimum;* and this direction is determined with reference to the minimum thick-

ness of armor that covers a considerable surface on the side; when, however, such thickness is not below a certain limit, which may be held to be about 150 millimeters. As to armor of less thickness, it should be held to be a useless burden, since it could not possibly prevent perforation.

In order to fix these ideas we may distinguish two cases:

(1) If the ship under consideration carries at the water-line a belt which has, over a considerable stretch, a thickness greater than 150 millimeters, and above has only thin armor, or if also above the belt the thickness of the armor is greater than 150 millimeters, the maximum defensive capacity may be held to be obtained in the directions inclined about 30° to that of the beam.

(2) If the ship has on its sides large extensions of armor with a thickness of about 150 millimeters, the maximum defensive capacity is obtained in the directions about 45° from the beam.

5. *Directions of Maximum Utilization.*—When a ship is opposed to another in long-range battle, it is said to have the other bearing in a *direction of maximum utilization* if it is inclined, with respect to the line joining it with the adversary, in such fashion as to enable it to use the maximum offensive power, while at the same time presenting itself also under the best defensive conditions.

What we have set forth demonstrates the existence of such directions, and precisely permits us to conclude:

(1) At the maximum fighting distances (between 8000 and 10,000 meters) the directions of maximum utilization are those of the extremes of the sectors of maximum offense.

(2) At inferior distances the directions of maximum utilization are those to which the maximum defensive capacity of the armor corresponds.

Naturally it is not intended to establish the rule that a ship must always keep the enemy bearing in one of the four directions of maximum utilization that are determined in this way; it is only insisted that these directions constitute *an element of the highest importance for tactical maneuvering.*

CHAPTER II.

RADIUS OF ACTION OF THE TORPEDO.

6. *Conditions of the Problem.*—The introduction into use of torpedoes having a speed of 31 knots an hour over a run of

nearly 6500 meters is announced; in what we say we shall have reference to this advanced type of weapon.

The inferior limit of long-range combat is given to us by the radius of action of the torpedo, the determination of which is therefore indispensable in order to proceed with the study of the tactics; the more so since the improvements in the torpedo seem to give reason for the belief that this weapon has almost completely invaded the field of the gun. It appears permissible to think so for the following reasons:

(1) The increase in the tonnage of battleships implies that they may be very long in order to enable them to reach high speeds.

(2) The launching distance may be greater than the run of the torpedo when the ship attacked is moving in the direction of the torpedo.

(3) Conceding that there may be scant probability of success in launching from a great distance against an isolated ship, we may at any rate rely upon the launching of torpedoes against an assemblage of ships.

It is of interest to estimate the importance of these matters, taking as a basis the following axiom: "A weapon, the action of which cannot be repeated except at considerable intervals of time, and of which the supply is very limited, must be employed only under conditions that may assure a notable probability of hitting." *

7. *Relation Between the Length and the Duration of the Run.*—The engine of the torpedo is devised for the maximum speed. Since we desire to determine the radius of action of the torpedo, admitting that this weapon may realize the best requisites to-day conceivable, let us suppose that the type of torpedo capable of running over 6500 meters at an average speed of 31 knots an hour, may have as a maximum speed per hour about 50 knots; and let us seek a relation that, within these limits of speed, may

* On the basis of this axiom, when the heavy guns had a very slow rate of firing, they were justly held to be unadapted for employment at the maximum fighting distances; these same cautions are to-day imposed upon the employment of the torpedo. Although there exists the possibility of a lucky hit when launching the torpedoes with small probability of hitting, we must keep in mind the necessity of being ready to launch when, owing to the closing of the distance, the probability of hitting is greatly increased. (Author's note.)

permit us approximately to calculate the duration of the run as a function of its length.

Let c be the length of the run expressed in meters; v the corresponding speed in meters per second; $t=\frac{c}{v}$, the duration of the run.

The ratio between the weight of air consumed during the run and the duration of the run itself, expresses the consumption of air in one second.

The weight of air consumed during the run is the difference between that which is contained in the charged tank, and that which remains therein at the end of the run. The latter is greater the higher the working pressure. Consequently, if, after a run of less than 6500 meters, we suppose the tank to contain the same weight of air that remains therein after a run of 6500 meters, we commit an error, by virtue of which, for a given speed, we shall be led to attribute to the torpedo a run greater than the actual run. Under the supposition mentioned, indicating by A the quantity of air consumed during the run, a and a_0 being the amounts consumed in 1 second corresponding to the times t and t_0, we have

$$a=\frac{A}{t}, \quad a_0=\frac{A}{t_0},$$

and hence

$$\frac{t}{t_0}=\frac{a_0}{a}.$$

F and F_0 being the indicated horse-powers for the speeds v and v_0, corresponding to t and t_0, the value of $\frac{a}{F}$ (that is to say, the consumption per horse-power in 1 second) continually increases the more the speed differs from that for which the engine was designed. In supposing that

$$\frac{a}{F}=\frac{a_0}{F_0},$$

if a_0 and F_0 refer to the maximum run, we thereby commit an error which, for a given speed, would lead us to attribute to the torpedo a run shorter than the actual run.

Taking the two preceding hypotheses together, that is, holding that

$$\frac{t}{t_0}=\frac{F_0}{F},$$

we are able to admit that the two errors mentioned may compensate each other. As, on the other hand, we may hold that the power varies approximately as the cube of the speed, we obtain

$$\frac{t}{t_0} = \left(\frac{v_0}{v}\right)^3.$$

By means of this equation, knowing by experiment that v_0 corresponds to t_0, we can deduce the time t for a speed v. Letting c and c_0 be the runs corresponding to t and t_0, we have

$$v_0 = \frac{c_0}{t_0}, \quad v = \frac{c}{t},$$

and, substituting in the preceding equation, we obtain

$$t = t_0 \left(\frac{c}{c_0}\right)^{\frac{3}{2}},$$

which is the equation sought; it shows that the duration of the run varies approximately as the $\frac{3}{2}$ power of the run of the torpedo.*

* To prove that the formula thus found is sufficiently trustworthy, we have recourse to the data of the experiments carried out in 1897 by Makaroff, who was the first advocate of long distance launching (*Cfr. Questioni di Tattica Navale,* trad. Saint-Pierre). Taking for c_0 and t_0 the values relative to the greatest run, we here set down the experimental and the calculated results:

c (experimental)	Speed per hour	t	c (calculated)	Errors
(meters)	(knots)	(seconds)	(meters)	(meters)
2774	11	504	....	....
2134	14	305	1985	— 149
1280	18	142	1192	— 88
640	23	55	633	— 7

For a modern type of torpedo we refer to data supplied by "Engineering" of Feb. 14, 1908, concerning the 18-inch, hot-air, Whitehead torpedo:

c (experimental)	Speed per hour	t	c (calculated)	Errors
(meters)	(knots)	(seconds)	(meters)	(meters)
3656	28	261	....	....
2742	32	171	2766	+ 24
1828	38	96	1877	+ 49
1371	40	68	1491	+ 120
914	43	42	1072	+ 158

(Author's note.)

Putting $c=6500$ meters, $t=\frac{6500}{15.5}=419$ seconds (15.5 being the speed in meters per second corresponding to that of 31 knots per hour), we obtain the formula

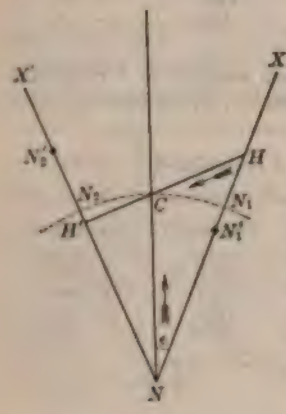
$$t=0.0008c^{\frac{3}{2}},$$

with which the following table is calculated:

c (meters)	t (seconds)	speed per hour (knots)
6500	419	31
6000	372	32
5500	326	33
5000	283	35
4500	242	37
4000	203	39
3500	166	42
3000	131	46
2500	100	50

8. *The Case of Two Vessels Opposed to Each Other.*—Let us determine successively: (1) The consequences of an error in the estimation of the direction in which the target is moving. (2) The consequences of an error in the estimation of the speed of the enemy.

(1) Evidently, an error $\pm\epsilon$ in the estimation of the course of the target would be included in a sector having an amplitude 2ϵ; the probability of hitting resulting from this for the torpedo will be so much the greater the nearer the torpedo's track approaches to a direction perpendicular to the bisector of the said angle 2ϵ. For the purpose which we propose for ourselves, it will be sufficient to refer to the case of a perpendicular impact.*



* Let XNX' be the sector with an amplitude 2ϵ which has for its vertex the position N of the ship at the moment of launching the torpedo; HH', the track of the torpedo, which accordingly has a forward angle of impact. If the course of the ship were NC, the torpedo would strike it at C. If, instead, the course were NH, at the moment at which the torpedo is at C the ship is on the arc of a circle with its center at N and with a radius, NC, which cuts the lines NX and NX' in the points N_1 and N_2 respectively; consequently on the arrival of the torpedo at the points H and H', the ship will be respectively at positions N'_1 and N'_2. The mean miss

Let N (Fig. 2) be the position of the ship at the moment at which the torpedo is launched, which torpedo would strike the center of the ship at C when the ship follows the track NC, normal to the path HC of the torpedo. If, instead, the course were NH, deviating by an angle ϵ toward the launching tube, in the time t in which it would have arrived at C, the ship will be in a position, N_1, such that $NN_1 = V_N t$; V_N being the speed of the ship in meters per second.

The ship will then be at a distance

$$N_1H = NH - NN_1 = V_N t\left(\frac{1}{\cos\epsilon} - 1\right)$$

from the point H at which the course crosses the track of the torpedo.

But the torpedo arrives at H at an instant which precedes that of the arrival of the ship at N_1 by an interval of time, $\frac{CH}{v}$; hence, when the torpedo is at H, the ship will be at a point, N'_1, such that

$$N'_1N_1 = \frac{CH}{v} V_N.$$

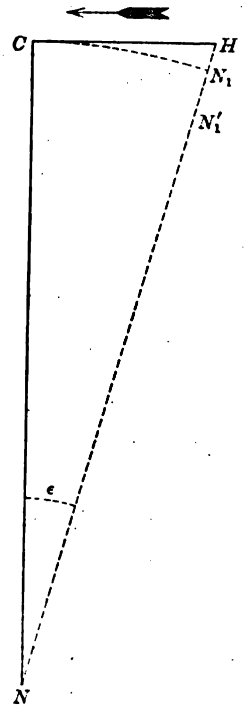


FIG. 2.

CH being equal to $tV_N \tan\epsilon$, if we indicate the amount of the miss by s, there results, then,

$$s = N'_1H = V_N t\left(\frac{1}{\cos\epsilon} - 1 + \frac{V_N}{v}\tan\epsilon\right).$$

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will hence be

$$\frac{N'_1H + N'_2H'}{2}.$$

It is readily seen that the nearer HH' is to being perpendicular to NC, the smaller are N'_1H and N'_2H'; therefore the mean miss diminishes and the probability of hitting increases.

It is now necessary to bear in mind that the particles of water which accompany the ship in its movement, in the case of a forward angle of impact, tend to place the torpedo perpendicular to the ship, or to insure the functioning of the firing pin; while in the case of an angle of impact abaft, the torpedo tends toward a course parallel to that of the ship. Therefore it must be held that the ideal condition for the torpedo is that with an angle of impact of 90°, because to that angle there corresponds a mean miss less than for a forward angle of impact, and there is no doubt of the functioning of the weapon. (Author's note.)

Considering ϵ to be negative in the case in which the course deviates toward the side opposite that of the launching tube, the preceding formula expresses in a general way the value of s, which is negative when the torpedo passes abaft the center of the target.

Indicating the length of the ship by L, in order that there may be a certainty of hitting the target, we must have $s \leqq \frac{1}{2}L$.

With $L=200$ meters, $V_N=10$ meters per second and $c=6500$ meters, we have

$$s=\pm\tfrac{1}{2}L \quad \text{for} \quad \epsilon=\pm 2^\circ \text{ (about).}$$

But we can have no confidence in being able to estimate the course of the ship * with a mean error less than 10°.

Always, for $V_N=10$ meters per second, with the values of t and v that correspond to the maximum run of 6500 meters, we get

$$\left.\begin{array}{ll} \text{for } \epsilon=+10^\circ, & s=+536 \text{ meters} \\ \text{for } \epsilon=-10^\circ, & s=-411 \text{ meters} \end{array}\right\} \text{a mean miss of 473 meters.}$$

With $c=3000$ meters, we get

$$\left.\begin{array}{ll} \text{for } \epsilon=+10^\circ, & s=+119 \text{ meters} \\ \text{for } \epsilon=-10^\circ, & s=-\ \ 80 \text{ meters} \end{array}\right\} \text{a mean miss of 99 meters.}$$

With $c=2500$ meters,

$$\left.\begin{array}{ll} \text{for } \epsilon=+10^\circ, & s=+85 \text{ meters} \\ \text{for } \epsilon=-10^\circ, & s=-55 \text{ meters} \end{array}\right\} \text{a mean miss of 70 meters.}$$

Hence, as the maximum value that we can suppose for L is 200 meters, we are justified in stating that, *beyond the limit of 3000 meters of run, the mean miss due to the error in the estimation of the enemy's course cannot be considered as less than half the length of the target.*

* It is to be noted that, until the recent improvements in the torpedo, there were admitted, as the mean errors in the course and in the speed of the target, the values of 10° and 2 knots respectively, reference being had to runs of about 1000 meters. With the increased runs, it is logical to recognize that the difficulties of estimating the movement of the target are increased; nevertheless, let us still hold the above mentioned values for the mean errors, so that, in this way, the correctness of our reasoning may be proved *a fortiori*.

(2) When an error, Δ, is made in the estimation of the speed of the enemy's ship, the miss s of the torpedo will be equal to the space passed over by the ship in the time t with a speed, Δ; or

$$s = \Delta t = \Delta \frac{c}{v}.$$

With an error, Δ, in order that the ship may be hit it is necessary to have

$$t \leqq \frac{\frac{1}{2}L}{\Delta}.$$

We can have no confidence in being able to estimate the speed of the enemy's ship with an error less than 2 knots; therefore, putting $\Delta = 1$ meter per second, and supposing that $L = 200$ meters, we must hold that $t = 100$ seconds is *the maximum duration of the run, with which the mean miss, due to the error in the estimation of the enemy's speed, does not exceed half the length of the target.*

In order to secure such a result with a run of 6500 meters, it would be necessary to have a corresponding torpedo speed of 65 meters per second; that is to say, a speed per hour of 130 knots, which we are very far from realizing.

Under the hypothesis of launching a torpedo against an isolated ship, this is well recognized, whatever may be the character of the improvements made in the torpedo; while the improvement in the gun is apparent when there is obtained, for a given caliber and at a certain distance, a residual velocity that previously was only obtained at a shorter distance, for the torpedo, instead of equality, we must have an increase of speed.

From the table in section 7 it is seen that $t = 100$ seconds corresponds to $c = 2500$ meters. For this run, the mean probable error due to the combination of the errors in the course and in the speed of the target will therefore be

$$s = 0.845\sqrt{70^2 + 100^2} = 103 \text{ meters.}$$

It is well to bear in mind: (1) That the miss calculated for the errors in the course has reference to the most favorable conditions for the torpedo. (2) That the torpedo is affected by a multiplicity of accidental causes of misses. In consequence of which we may hold that this weapon can have a sufficient probability of hitting an isolated ship, only when the mean probable

error depending upon the errors in the course and in the speed of the target, does not notably exceed the value of $\frac{1}{2}L$, which corresponds to a probability of hitting of 50 per cent.

It seems, then, that we may logically affirm that *the actual profitable run of the most improved torpedoes cannot be set down as greater than 2500 meters.*

Since, as is well known, the angle of 30° may be held to be the minimum angle of impact of the torpedo, the maximum launching distance SN (Fig. 3) against a ship in a position, N, with a

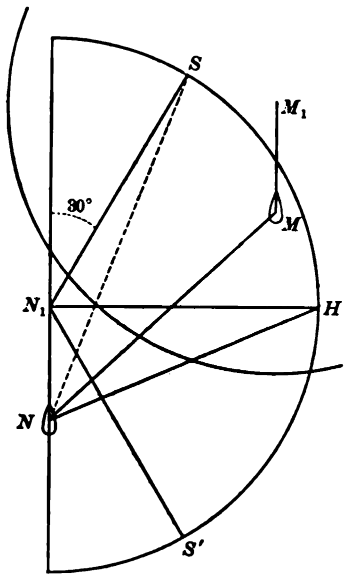

FIG. 3.

speed $V_N = 10$ meters per second, may be obtained by constructing a triangle, NN_1S, in which

$$NN_1 = V_N t = 1000 \text{ meters},$$
$$NN_1S = 150°,$$
$$N_1S = 2500 \text{ meters}.$$

From this triangle we find $SN = 3400$ meters.

Let it be noted that the speed supposed for N is not small, and that the launching distance would be less than that obtained whenever N might have S bearing in a sector of maximum offense of the guns. We may therefore affirm that, in the case

of an isolated ship, the radius of action of the torpedo is to be set down as less than 3500 meters; or in other words, *beyond the distance of 3500 meters from the enemy, a ship may maneuver without troubling itself about torpedoes.*

9. *The Danger Zone* (Fig. 3).—The geometrical locus of the positions from which torpedoes may be launched to strike the ship after a run, c, is obtained by making $NN_1 = V_N t$, describing a circle with its center at N_1 and with a radius c, and then limiting to the right and left of the ship, the arcs—as SS'—included between the two straight lines passing through N_1, and which form angles of 30° with the course.

Any such circle includes within itself the circles corresponding to shorter runs. Indeed, the difference $c - V_N t$ diminishes with t; and hence, indicating by c' and t' two other corresponding values of the length and the duration of the run, when $t' < t$ we shall have

$$c - c' > V_N(t - t').$$

The difference between the radii of the two circles considered is therefore greater than the distance between the centers; or, the two circles have no points in common.

The circle traced for the greatest run to which corresponds a sufficient probability of hitting, therefore includes *the danger zone* with respect to the torpedoes.

The eccentric position of the ship in this zone so determines matters that a combatant may find himself within the radius of action of the enemy's torpedoes, without having the enemy within the radius of action of his own torpedoes. Thus, in Fig. 3, the ship N has the enemy M in his danger zone, while it is itself outside of the zone of M (which has a center at M_1, such that $MM_1 = NN_1$). This leads to the establishment of *the preference that is possibly to be given to bearings abaft the beam,* in the field of the torpedo.

10. *Concentration of Torpedoes.*—The circle, traced as above described for the maximum run of the torpedo (6500 meters), limits the danger zone for the concentration of torpedoes. This zone is greatly extended forward of the ship's beam; indeed, the launching distance NS, corresponding to the minimum forward angle of impact, is even slightly greater than 10,000 meters, for the ordinary speed of 20 knots per hour, which, at present, it is well to hold as the mean battle speed.

By virtue of what has been said in section 8, we observe that, at the limit of this danger zone, the percentage of effective torpedo hits is very small. We have seen, in fact, that to a mean error of 10° in the course of the target, there corresponds a mean miss of 473 meters; and that for an error of one meter per second in V_N we have a mean miss of 419 meters; hence, the probable mean error that must be reckoned upon in virtue of the two partial errors aforesaid, is 534 meters. The 50 per cent stretch is thus 1068 meters, and the percentage of effective hits against a ship 200 meters long, is, then, 10 per cent.

On this basis, there would appear to be rational a concentration, which, however, should be executed with at least five torpedoes; thus having the probability of obtaining the result that may be expected from a single torpedo, launched for a run of 2500 meters.

This cannot be accepted unconditionally; in fact, the above mentioned value of the miss, due to the error in the course of the target, has reference to the hypothesis of a perpendicular impact. The miss increases with the obliquity of the impact, and besides, it must be remembered that, with the same length of run for the torpedo, the error committed in the estimation of the course and of the speed is evidently greater the greater is the launching distance.

It seems logical, then, to admit the possibility of having, with a run of 6500 meters, 10 per cent of effective hits, when, however, the impact is normal.

The position H, from which a hit with normal impact can be made with a run of 6500 meters, is found to be at a distance of 7500 meters from the ship.

It is clear that, from this distance, the ship N can render impossible the concentration of the torpedoes of several ships by means of an opportune hindrance of their maneuver; so disposing that the enemy's line may not be a secant of the danger zone in the segment occupied by the formation.

This hindrance may be determined by deducing graphically the maximum launching distances for the different bearings from the ship's head, which permits fixing the idea in the following manner: In order to have the certainty of rendering impossible the concentration of torpedoes, the enemy's ships must not be brought to bear at less than a certain angle from the bow, which

angle is respectively 60°, 90° and 120°, for ships distant about 7500, 4500 and 3500 meters.

It is well to observe that, for the concentration of torpedoes, two conditions are required: (1) The line of formation of the ships launching the torpedoes must be suitably inclined with respect to the line joining it with the adversary.

(2) The course of the latter must be favorable to the launching, and it must be kept exactly constant for the duration of the run of the torpedo; a duration that, for long runs, is very considerable.

Since, in a combat between battleships, we cannot, as in the attack of torpedo boats, count upon a surprise for taking up an advantageous position, it is not very probable that the two conditions above mentioned can be realized at one and the same time.

It seems allowable, then, to conclude that, although the concentration of the torpedoes of several ships may not be absolutely prevented within the radius of 7500 meters (and this renders it advisable not to bring the enemy to bear in the neighborhood of the bow), still, there is no great cause for apprehension concerning it; and, reciprocally, it is not well to rely too much upon this employment of the weapon.

11. *Launching Against an Assemblage of Vessels.*—As is well known, on the basis of the theory of probabilities, a target, the extent of which in a certain direction is four times the length of the 50 per cent stretch, includes all the shots.

In the preceding section, it is seen that a 50 per cent stretch, about 1000 meters long, corresponds to the maximum run of the torpedo; consequently, all the shots are included in a formation that extends at least 4000 meters normally to the mean track of the torpedoes.

The launching must be directed to strike the center of the formation; and, naturally, from what has just been said, its success must depend upon the course of the ships attacked, with a probability that the track of the torpedo may cut the formation in one of the vacant spaces. It is well to note that, for formations in single line and at a distance of 500 meters between the centers of two adjacent ships, in the most favorable case of $L=200$ meters, the said vacant spaces amount to about three-fifths of the total line.

Hence, we may not exclude the case that some ship may be in a position for launching with a fair probability of hitting, but it

is not well to rely upon launchings by several vessels against the enemy's assemblage, unless the formation of the latter is of extraordinary length, or unless he adopts a bow and quarter-line formation, and unless his course is favorable.

In employing torpedoes, either with a view to concentration or when considering the enemy's fleet as a single target, it is well to bear in mind that we face the following dilemma: either we launch from a long distance and very probably only waste torpedoes, or we launch from a distance somewhat greater than the limit established for the case of two ships opposed to each other, and so run the risk of being found unready to launch them within the really effective radius of the weapon, should the distance rapidly be shortened in an unforeseen manner.

In conclusion, beyond the range of 3500 meters determined in section 8, the employment of the torpedo may not be excluded, but is only occasional; so that, from the point of view of the defense, there is no occasion to trouble oneself very much about it; and from that of the offense, it is well not to sacrifice, even in a minimum degree, the employment of the gun.

CHAPTER III.

ADVANTAGEOUS POSITIONS.

12. *Alignments.*—The formation of a fleet of ships is defined by the lines joining the units of the formation, and by the angles that these lines make with the direction of movement.

The study of tactics cannot be reduced to that of fixed formations, the importance of each single formation not being absolute but relative to the situation of the moment.* The idea, then, that the formations are to be considered as consequences of the maneuvers, having the objective of acquiring or maintaining determined relative conditions of position with respect to the enemy, must be held to be fundamental. From this arises the necessity of fixing in the mind the advantageous positions in long-range combat, and of doing this in a way that, as far as possible, may be independent of the formations.

* "C'est moins l'ordre qui a de l'importance, que la position relative des combattants; . . . . tout l'effort doit tendre à donner à ses forces une position de combat favorable." Daveluy, *L'esprit de la guerre navale—La tactique*, 1909.

In order to obtain such maximum generality of reasoning, it is principally necessary to have reference to the relative position of the lines of the enemy's formation, supposing the inclination of the ships on their respective lines to be variable.

Naturally, it is necessary to take into account the length of the various segments of the line occupied by each party. To the geometrical figure composed by these segments we will give the name of *alignment* (*schieramento*).

A few definitions are necessary concerning the various kinds of alignment that it is well to distinguish, in relation to the hypotheses that we shall have to consider.

We say that a naval force has a *double alignment* when its ships are arranged on two adjacent parallel lines; the alignment of a naval force is *simple* when it is in single line.

Alignments may be rectilinear and curvilinear; we will call *angular* the alignments composed of two rectilinear segments that are not prolongations of each other.

When a naval force maneuvers by separate groups, by *alignment of the naval force,* we mean that composed by the segments that join the centers of the single groups; the alignment of each group being defined in the manner above stated.

By *the inclination of a rectilinear alignment* we mean the angle formed by the alignment and the line joining its center with the center of the enemy's alignment.

13. *Zones and Sectors of Offense.*—In order to fix these ideas, let us first of all suppose that we have, in column of vessels (Fig. 4), a naval force composed of ships whose sectors of maximum offense extend 45° forward of and 45° abaft the beam. It is clear that if we draw from the leading ship the straight lines *AH, AH'*, making angles of 45° from the bow; and from the rearmost vessel the straight lines *CK, CK'*, making angles of 45° with the direction opposite that of the course, these lines, and the length of the formation, limit the zones *HACK, H'ACK'*, which are those of maximum offense, when, however, the ships do not all fire at one and the same target.

Rigorously, from the above-mentioned zones it would be necessary to subtract those of minimum offense, *ADB, BEC,* . . . . but it is evident that these need not be taken into account except at short distances.

The said zones *HACK, H'ACK'*, and the corresponding sectors of minimum offense, *HAH', KCK'*, refer to the case of *the distribution of the fire;* while it is evident that, under the hypothesis of the *concentration of the fire*, the sectors of minimum offense—for the formation under consideration—are wider, and the zones of maximum offense are more restricted.

As, for a ship, we distinguish the sectors of maximum, and those of minimum offense, so, for any formation, there exist *zones of maximum offense,** and *sectors of minimum offense.*

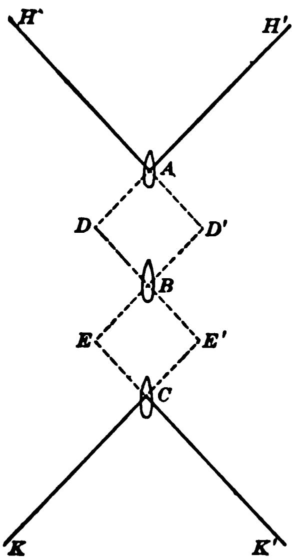

FIG. 4.

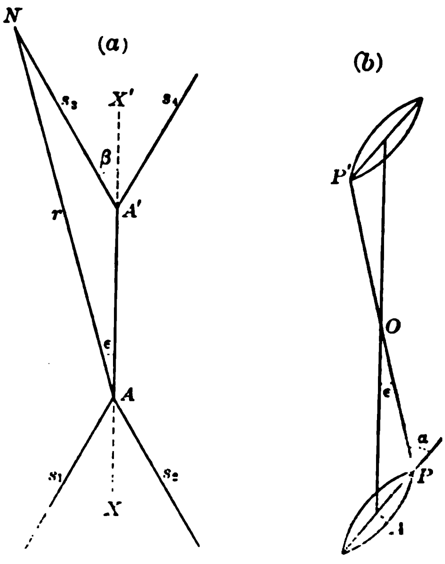

FIG. 5.

If, instead of to a special formation, we refer to the alignments in general, the amplitude of the zones of maximum offense are determined, taking into account the inclination of the ships which is most opportune for diminishing the amplitudes of the sectors of minimum offense. With this object, given a simple rectilinear alignment, *AA'* (Fig. 5a), the inclination just mentioned is determined by the limit condition that each ship, firing in an extreme

* We say *zones*, and not *sectors*, as in the case of a ship, because, if the ship may tactically be considered as a point, the length of the formation is anything but negligible. (Author's note.)

direction of a sector of maximum offense (the angle which this direction makes with the longitudinal axis we will call α), tangents the ship adjacent. Indicating by ϵ (Fig. 5b) the angle thus made between the alignment and the direction of the plane of fire, with d as the interval between ships and with L as the length of each ship, from the triangle OAP (O being the point in which the alignment intersects the line PP' joining the extremities of two adjacent ships) we have

$$\frac{\sin \epsilon}{AP} = \frac{\sin \alpha}{OA},$$

and hence

$$\sin \epsilon = \frac{L}{d} \sin \alpha,$$

from which, with the mean data ($L = 150$ meters, $d = 500$ meters, $\alpha = 45°$), we obtain $\epsilon = 12°$; for safety's sake let us say $\epsilon = 15°$.

From this it follows that, if we draw from the extremities of the alignment four right lines forming angles of 15° with the prolongation of said alignment, we determine the zones of maximum offense and the sectors of minimum offense; in the case, however, in which it is not required that the offense of several ships shall converge upon one and the same target.

When this last condition is established, it must be borne in mind that, beyond a certain limit, the greater the number of ships that take part in the concentration, the smaller is the effect of the firing.

This diminution of effect cannot be considered if the concentration is evidently imposed by special conditions of position; but, in general, it is necessary to limit the number of ships destined to fire at one and the same target.

There is no difficulty in admitting that the fire of three or four ships may be concentrated. Without entering into the methods for the control of the firing during concentration, one datum to be remembered is that Togo, who at Tsushima had 12 armored ships, has written in his report that he concentrated his fire upon two of the enemy's units; hence it seems permissible to believe in the concentration of the fire of six units also, and, without experience to the contrary, it is well to hold this number of units to be the maximum.

On this basis, in the case of the concentration of the fire, it is well to consider the alignment as divided into elementary parts,

each having the length $(n-1)d$; n being a number of ships not greater than six. AA' (Fig. 5a) being one of these parts, we form the triangle $AA'N$, wherein $NAA'=\epsilon=15°$, and N indicates the position of a hostile ship at a distance $r=NA$ from the most distant point of AA'. Indicating by β the angle $NA'X'$ formed by NA' with the prolongation of the alignment, it is clear that the lines s_1, s_2, s_3, s_4, drawn from A and A', making angles β with AX and $A'X'$ respectively, determine the zones of maximum offense for the supposed value of r.

With a value of r anywhere between 10,000 meters and 6000 meters, β is about 20°; and the difference $r-r'$ is about 2000 meters (r' being the distance of N from the nearest point of AA').

14. *Concentration and Distribution of the Fire.*—Let us suppose that one of the combatant parties, which we will indicate by C, concentrates his offense; while the other, which we will call R, directs the offense of each ship against a ship of the adversary. The party C secures tactical and strategical advantages, because R is hampered in his movements owing to one of his units having the sum of all the injuries that, on the other hand, are distributed among the different units of C. It would then appear logical to establish the concentration of fire as a tactical objective, executing this concentration successively upon the various units of the enemy, changing the object of concentration whenever one is put out of action. Thus, one group of ships, with respect to another hostile group, should concentrate the offense upon one ship; and several groups should endeavor to concentrate their offense upon one and the same group of the enemy.

This seems to be confirmed by history. Indeed, the objective of the two greatest tactitians of the sailing period, Suffren and Nelson, was the concentration of forces; it must be remembered, however, that they attacked a part of the enemy's line, relying upon overcoming it before the remainder of the forces could come to its aid. This reliance was justified: (1) by the slowness of the movements of the sailing ship; (2) because the fighting could not be efficacious unless the vessels came broadside to broadside with those of the enemy. It resulted from this that *the forces not attacked were placed under conditions of non-offense for a time sufficient to secure decisive results.*

Naturally, the advisability of concentration is indisputable

to-day as in the past, when we have conditions of position analogous to those pointed out; or when the part of the enemy against which the offense is not directed is in a position of inability to offer offense; that is, when our own forces are in a sector of minimum offense of the enemy's alignment. The analogy also exists when a part of the enemy's force is so distant with respect to the remainder as to offer a sensibly less efficacious offense. In other words, the advisability of concentration is clear when, with respect to the enemy, we have an advantageous position.

Definitions.—When an alignment has not the advantage of being in a sector of minimum offense of the enemy, it may be said that, with respect to the said enemy, its position is tactically advantageous, or equivalent, or disadvantageous, according as—supposing the enemy's offense to be concentrated in the best manner—it permits of executing the firing at distances less than, equal to, or greater than those at which the enemy fires.

With equivalent alignments it must be remembered that, in concentrating the offense, the ships at which we do not fire are in conditions of tranquillity; and hence there exists the advisability of distributing the fire, because the offense offered is also a reciprocal function of the offense received.

This last advisability cannot be considered when the distance exceeds a certain limit, which it seems should be placed at 8000 meters; in such case concentration becomes a necessity, to the end that the offense may be efficacious, and its results may quickly be tangible; and this, remembering that, as the distance increases, the probability of hitting rapidly diminishes.

Under such conditions it is then indispensable to prescribe that the ships of one and the same group (taking into account the limits pointed out in the preceding section) shall concentrate their fire upon one of the enemy's ships; this, however, does not imply the advisability of two groups of ships having for objects of concentration two hostile units forming part of the same group, when our own groups are not in a sensibly advantageous position with respect to the enemy's groups. Indeed, the convenience of distributing the fire must here be considered analogously to what has been set forth above; besides, the tactical necessity of dividing the ships into groups according to the standard of homogeneity is evident. So, then, having two units damaged in one of these groups, a combatant has his maneuver-

ing qualities reduced in that group only; while, if the damaged units form parts of two different groups, the maneuvering qualities of the whole fleet undergo a reduction notably greater.

In conclusion, we may formulate the following general criteria, the application of which is naturally subordinated to the necessity of not often changing the objective that it is sought to secure:

(1) At the maximum fighting distances it is necessary for the ships of each single group to concentrate their fire.

(2) When the distance is below a certain limit (8000 meters), it is best to distribute the fire, unless one has a sensible advantage of position, sufficient to render concentration advisable.

(3) In concentrating the fire from equivalent positions, the enemy's ships which are the object of concentration should preferably belong to different groups.

ELEMENTARY ALIGNMENTS.

15. *The Ship Upon Which to Concentrate.*—For the analysis of the advantages of position, let us refer, first of all, to the hypothesis of elementary alignments; or to simple, rectilinear alignments of a length not exceeding 2500 meters, necessary for six ships placed at intervals of 500 meters. At the present time this distance is to be considered as normal, by reason of the high speed and the dimensions of the battle units. From what has been noted in section 13, it is possible to concentrate the fire of all the ships of the alignment upon a single enemy's ship.

When not otherwise indicated it will be understood that the length of the adversary's alignment is supposed to be the same.

The natural target for each ship is evidently the nearest; or, it is that which is found at the foot of a perpendicular dropped from the ship upon the enemy's alignment. It follows from this that, except under special circumstances, the most opportune ship for the concentration of fire must be held to be the one that is nearest to the center of the projection of our alignment upon that of the enemy.

It is also necessary to take into account the importance of *continuity* in the concentration of the offense. From this results the advisability that the enemy's ship upon which the fire is concentrated should be at an extremity of the alignment; which,

in its turn, we shall see confirmed when we come to discuss the maneuvering.

We establish, then, that in general *the enemy's ship for concentration should be the extreme one which occupies the position nearest the center of the projection of our alignment; or, such ship is the extreme one on the side on which the inclination of the enemy's alignment is less than 90°.*

By this rule we may determine the ship for concentration, unless the inclination of the enemy's alignment to the line joining the centers is 90°. There may then arise two cases: (1) Our own alignment is also normal to the line joining the centers. (2) Our alignment is not inclined 90°.

In the first case it evidently makes no difference upon which extremity of the enemy's alignment we concentrate.*

In the second case, firing upon the extremity which is toward the point where the alignments converge, it is discovered that, with respect to the other extremity, the limits between which the firing distances are included are wider. Moreover, it may not always be possible to concentrate the offense upon the aforesaid extremity, which may be in a sector of minimum offense; while a certain advantage in fire control may result the more nearly we approximate to uniformity of distance. In any event, in the case to which we now have reference, the proper extremity is not precisely designated by the conditions of distance, and hence is selected on the basis of the objectives of the maneuvering.

16. *Inclination.*—It is easy to discover (see Fig. 6) that, to an alignment, A_1A_2, normal to the line joining its center C_A with the center C_N of the enemy's alignment, N_1N_2, we can oppose only an equivalent, or a disadvantageous alignment. In fact the party N may have an alignment normal to C_AC_N, and then the

* It is to be noted that if we were to concentrate the fire upon the enemy's center, rather than on an extremity, the firing distances would not be sensibly different. Calling r the distance between the centers, r_m the mean firing distance, for alignments 2500 meters long, we obtain the following:

VALUES OF r_m.

r.	Firing on the center.	Firing on an extremity.
8000 meters	8045 meters	8200 meters
6000 meters	6065 meters	6250 meters

(Author's note.)

alignments are equivalent; or, it may assume an alignment differently inclined, as in the figure. In the latter case, from what has been said in the preceding section, the ship for the concentration of the A party is N_1; and that for N is A_1, it being supposed that the angle $N_1C_NC_A$ is not too small. Drawing from N_1 the perpendicular N_1P_A to A_1A_2, the firing distances for A are between P_AN_1 and A_2N_1; and those for N are between N_1A_1 and N_2A_1.

We have

$$N_1A_1 > P_AN_1.$$

The two triangles $N_2N_1A_1$ and $A_2N_1A_1$ have the side N_1A_1 in common; the sides N_2N_1 and A_2A_1 are equal; the angle

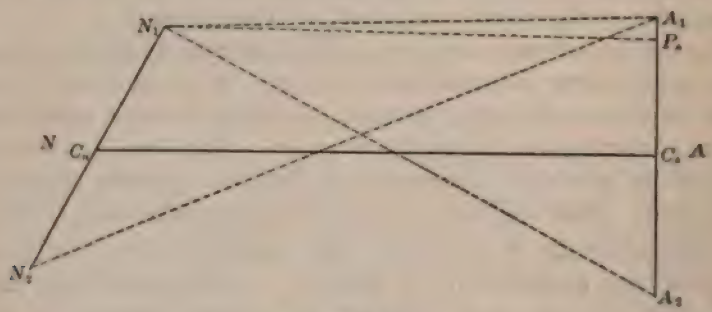

FIG. 6.

$N_2N_1A_1$ is obtuse, while $N_1A_1A_2$ is acute; hence

$$N_2A_1 > A_2N_1.$$

Analogously it is demonstrated that the firing distances of N are also greater than those of A when the firing is concentrated upon A_2.

The alignment of the party N is therefore a disadvantageous one, conformably to the proposition enunciated; from which we quickly draw the following deductions: (1) If the enemy's alignment is not normal to the line joining the centers, our assuming an alignment normal to the said joining line places us in an advantageous situation. (2) Of the two alignments, the situation of the one whose inclination to the line joining the centers is nearest to 90°, is the most advantageous. (3) With equal inclinations to the said joining line there is equivalence. It is worth while to note that, when this is realized, the angles that the lines

joining the corresponding vessels make with their directions are equal.

The inclination to the line joining the centers generally constitutes the best guide for estimating the advantages of position.

Definitions.—To the position of the alignment inclined to 90° to the line joining the centers we give the name of *fundamental tactical position.*

We say that an alignment *crosses the T* (or is in position to T) when it is in the enemy's sector of minimum offense.

For *crossing the T*, that inclination which permits having the minimum firing distances, would seem to be the best; in other words, in penetrating into the enemy's sector of minimum offense, it would be necessary to incline our alignment, at the extremity nearest that of the enemy, as far as the limit of his zone of maximum offense. Let us consider (Fig. 7) wherein $\beta = XA_1N_1 = YN_1A_2$ is the angle of which mention was made in section 13; this shows an alignment of A that crosses the T. The alignment N_1N_2 may still fire upon A_2, but A is in a momentary situation that is very advantageous, because its firing distances, putting $r = N_1A_2$, are practically included within the limits, r and $r-2000$; while for N, the distances are between the limits, r and $r+2000$.

But, in order to escape from this disadvantageous position, it is enough for the party N to rotate his alignment in a way which will permit him to fire upon A_1; in other words, in order that the positions may be equivalent, it is sufficient for the party N to rotate his alignment through the angle $N_2N_1N'_2 = A_2N_1A_1$; a greater rotation produces an advantage for N.

It is seen, then, how easy it is to eliminate the advantage of A when the T is crossed in the manner indicated; it is well, therefore, to seek to secure an advantage which, although smaller, may be maintained for a longer time. It is evident that the position of N will be so much the longer defective, the greater the amplitude of the rotation necessary to establish equivalence. It results from this that *the advantageous alignment for crossing the T is the fundamental one, A_2F.*

It is clear that, with alignments of different lengths, the shorter one is in a theoretically advantageous position, not only when, with respect to the enemy, it has an inclination nearer the fundamental one, but also, when it has an inclination equal to that of the enemy.

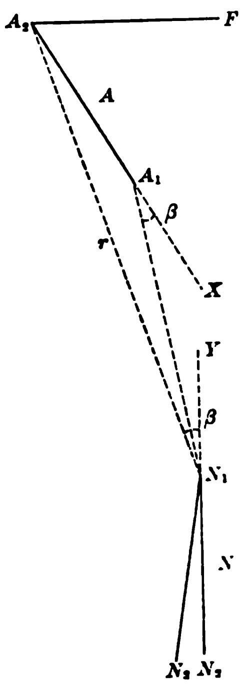

FIG. 7.

In the practical cases, the difference in length between two alignments that are not very different in strength cannot be very great. The difference in the number of ships may be one or two; and hence the difference in length may be 500 or 1000 meters; and since only a small part of it can affect the conditions of position, its influence appears to be negligible.

17. *Equidistant Positions.*—In this part of the subject, in studying the momentary situations—although without entering into an examination of the movements—it is necessary to keep in mind as a guide the practical object sought.

The deductions drawn in the preceding section have real practical importance, because they permit us to estimate whether it is better to change the alignment, and if so, how.

Except in special cases, even if two adversaries move, keeping their rectilinear alignments unchanged, evidently their inclination to the line joining their centers changes. Since a rectilinear alignment cannot be instantly changed, it appears necessary, as a compliment to the deductions just mentioned, to seek for a form of alignment that closely approximates to the fundamental one, and that, with respect to the line joining the centers, can easily and continuously be maintained.

To this we come with the following observations:

(1) An elementary alignment in the arc of a circle having for its center an enemy's ship, may practically be considered as a rectilinear alignment normal to the line joining its center with the aforesaid enemy's ship.

(2) Two adjacent ships of an alignment may be said to be on the arc of a circle having an enemy's ship for a center, when, for each one, the straight lines joining them respectively with the friendly ship and with the hostile ship, form an angle of about 90°.

(3) It is well known that the simultaneous change of course of several ships must of necessity be successive at very short intervals of time; each ship having to wait for the movement to be begun by the ship next within, on the side toward which the change is made. From this it follows that, in the tactical steering of an elementary alignment, the extreme ships are to be considered as regulators; inasmuch as we can conceive that, while one of them completes the movements of the change of course in a wide sweep, the others may imitate them in a continuous manner, tending to maintain the parallelism of the courses. This being the case, on the basis of the two preceding observations, it appears advisable to consider what alignment is obtained *if every ship continually maneuvers with the criterion of considering itself in position when the angle between the line joining it with the*

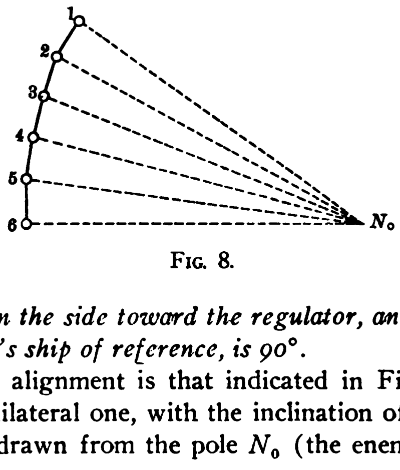

FIG. 8.

adjacent ship on the side toward the regulator, and that joining it with the enemy's ship of reference, is 90°.

The form of alignment is that indicated in Fig. 8; this form is a broken equilateral one, with the inclination of its sides to the radius vectors drawn from the pole N_0 (the enemy's ship) equal to 90°.

Distinguishing the units of the alignment by numbers from 1 to 6—No. 1 being the regulator ship—and indicating the respective distances from N_0 by $r_1, r_2, \ldots . r_6$, we have

$$r_2^2 = r_1^2 - d^2,$$
$$r_3^2 = r_2^2 - d^2 = r_1^2 - 2d^2,$$
$$\ldots\ldots\ldots\ldots\ldots,$$
$$r_6^2 = r_1^2 - 5d^2.$$

With the customary value of $d = 500$ meters we obtain:

for $r_1 = 8000$ meters, $r_6 = 7920$ meters;
for $r_1 = 6000$ meters, $r_6 = 5900$ meters;
for $r_1 = 4000$ meters, $r_6 = 3840$ meters.

Within the limits of long-range battle—the difference $r_1 - r_6$ being thus absolutely negligible—the form of alignment that is obtained in the manner above indicated may in effect be held to be that on an arc of a circle, or at positions equidistant from N_0: and hence, by the first of the preceding observations, it constitutes a rectlinear alignment normal to the line joining its center with N_0.

Such a form of alignment satisfies the requisites above specified; in other words, if N_0 is the center of the enemy's alignment, and we suppose that our forces have the fundamental tactical position, this position thus appears to be susceptible of being maintained.

Reserving it to ourselves to discuss in its turn this question with regard to the maneuvering, we hold meanwhile that, in order continually to tend to the securing of the advantages of position pointed out in the preceding section, the alignment with equidistant positions with respect to the enemy's center will generally appear to be advisable.

It is readily seen that if our force is outside of the zone included between the perpendiculars to the enemy's alignment drawn from its extremities, a sufficiently advantageous form of alignment may be that with positions equidistant from the enemy's nearest extremity; and it is so much the better, the nearer the position of our center to the prolongation of the enemy's alignment.

18. *Composite Alignments.*—Two contiguous elementary alignments, one on the prolongation of the other, constitute a composite rectilinear alignment.

Two alignments of this kind opposed to each other, if of equal length and equally inclined to the line joining the centers, are in equivalent positions; because, from what has been said in sections 14 and 16, equivalence exists between the corresponding elementary alignments. It is readily seen that, for a given inclination to the enemy's alignment, the most advantageous position for our own alignment (if the condition is imposed that it be rectilinear) is the one normal to the line joining the centers; because in this way, the single rectilinear alignments are in positions nearest that of the fundamental position.

The condition mentioned (rectilinear alignment) is, however, neither necessary nor advisable. In regard to position, it is

advantageous (and it is intuitively seen that it may be desirable for elasticity of maneuvering) that each elementary alignment, while respecting the bond of compactness, be left free to incline itself in the most opportune manner. From this are derived *angular* alignments, like that of Fig. 9, in which one elementary alignment of A is normal to $C'_A\ C'_N$, and the other is normal to $C''_A C''_N$.

In practice, from what has been said concerning equidistant positions, the angular alignment may be composed of arcs of circles having their respective centers in convenient points of the enemy's line.

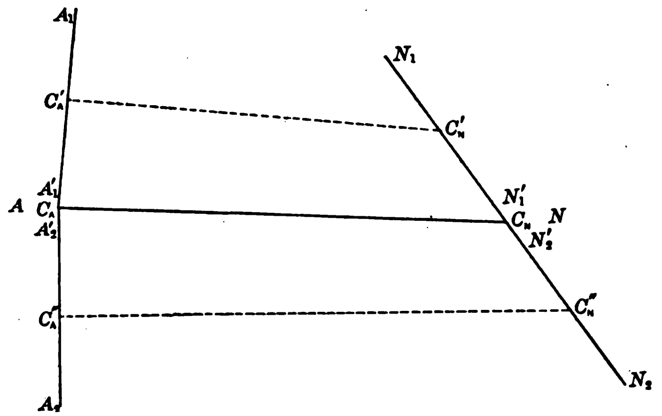

FIG. 9.

As has been noted in section 14, when the inclination of the enemy's alignment to C_AC_N differs notably from 90°, the concentration of the offense of the two elementary alignments of A upon two ships of the same elementary alignment of the enemy is advisable; in such case the alignment of A becomes nearly the arc of a circle with its center in the middle of the said elementary alignment of the enemy.

On account of the disadvantages of position and the manifest difficulty of maneuvering which is encountered with alignments of great length, the hypothesis of greater lengths than those that are included in the two elementary alignments of six ships each, is logically to be excluded.

19. *Double Alignments.*—The number of ships that can maneuver in a single line being thus limited, in order to keep compact a force of greater size, it is necessary to have recourse to an align-

ment on two parallel lines, near to each other, so placing the ships in the line on the side away from the enemy, that they may fire through the intervals of the other line.

When the fleet is not very numerous, it seems logical to make use of such an expedient for reducing the length of the alignment.

It is observed, furthermore, that a group of antiquated ships, and ships deficient in protection, but yet having good speed, such as not to embarrass the tactical and strategical control of the fleet, may represent an element of offensive power that can usefully be employed against an enemy's armored fleet. In order to employ such ships, safeguarding them in order to prevent the enemy from bringing about their loss by means of a brief concentration of force, which would produce serious moral effects, one of two systems worthy of consideration is that of placing the said ships, so as to enable them to fire through the intervals of the other line. Thus we have a third case in which the double alignment may be of use.

Evidently, for such alignments, there exists the importance of the fundamental position; that is to say, there exist the principles deduced in the preceding section for simple alignments.

It is intuitively perceived, however, that, with this form of alignment, besides rendering it possible for the enemy to launch torpedoes from long distances with a certain possibility of hitting—as has been noted in the preceding chapter—we encounter other notable inconveniences with respect to a simple alignment.

(1) Diminution of the maneuvering qualities of the fleet; difficulty of taking up angular alignments.

(2) Increase of the amplitude of the sectors of minimum offense.

With the first of the inconveniences mentioned we shall occupy ourselves in Part II of our study. In order to estimate the second, we observe that, in order to fire in the intervals between the ships of the inner line, the limit of approach to the ships of the inner line by the ships of the outer line is naturally determined by the condition that the distance between ships shall not fall below the normal distance of 500 meters.

This being understood, let us determine the am[illegible]f the sectors of minimum offense of an elementary do[illegible]
abc, a'b'c' (Fig. 10), composed of six ships in [illegible]
ogous to that which was used in section 13 f[illegible]

Let us consider the triangle aba', formed by two ships, a and b, of the inner line, and by a', which fires through their interval. From what has been said in section 13, the position of a' is the limit position which permits offense in the direction of the alignment cba when there is is realized

$$ba'a = \epsilon_1 + \epsilon_2,$$

where (45° forward of and abaft the beam being the amplitude of the sectors of maximum offense of the ships under considera-

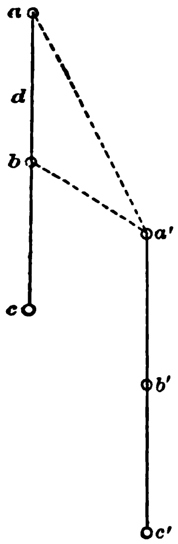

FIG. 10.

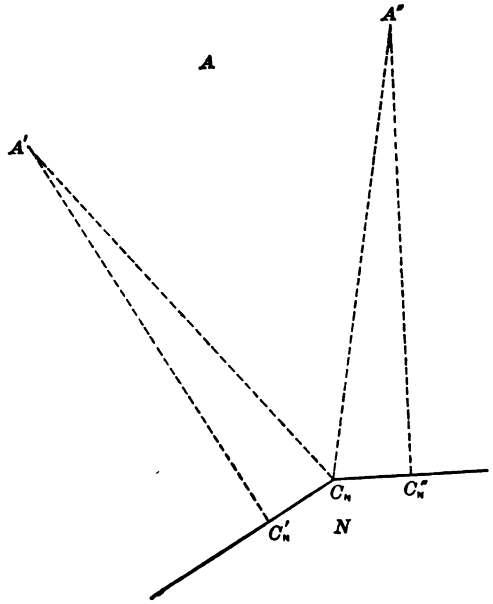

FIG. 11.

tion, and L the length of said ships) the angles ϵ_1 and ϵ_2 are deduced from the equations (section 13)

$$\sin \epsilon_1 = \frac{L}{ba'} \sin 45°,$$

$$\sin \epsilon_2 = \frac{L}{aa'} \sin 45°.$$

To the end that the offense may converge upon a single target, the value of $ba'a$ must be somewhat greater than that above mentioned. It is found by trials that the limit position of a' (which determines those of b' and c') may be held to be reached when

$ba' = a'c = d$; consequently, indicating by β (as in section 13) the half amplitude of the sector of minimum offense of the double alignment, we have $\beta = 60° - 15° = 45°$ (about), to be compared with the value $\beta = 20°$ obtained under the hypothesis of the simple alignment.

On account of the inconveniences pointed out, it seems logical to affirm that the double alignment is not to be adopted except in case of absolute necessity.

20. *Groups.*—We will now consider the hypothesis that the parties A and N, opposed to each other, are of the same strength and each formed by two elementary alignments, which, for the party A, are separated into the groups A' and A''; while N has his forces compact and on a simple alignment.

In Fig. 11 we indicate by A' and A'' the positions of the centers of the respective groups, the alignments of which we suppose to be in the fundamental positions with respect to the nearest elementary alignment of N.

If A' and A'' are at the same distance from C_N, the party N, by assuming an angular alignment with the sides respectively normal to $A'C'_N$ and $A''C''_N$, places itself in a position of tactical equivalence.

If A' and A'' are at sensibly different distances from C_N, the party N may assume an opportune alignment with respect to the nearest group and concentrate the offense on two of its ships; in this way the situation of N is advantageous. Moreover, when the angle $A'C_NA''$ exceeds 90°, it may befall that the party N can utilize the guns on both sides. It is therefore necessary to bear in mind that while in the sailing period the concentration had logically to be sought by placing the enemy between two fires, to-day the opposite is important. Naturally this consideration has no importance in case the party N is entirely made up of ships all of the principal guns of which have a field of fire on both sides.

In general it may be understood that the position of the compact fleet is so much the more advantageous the nearer it is to the line joining the groups (externally or internally).

From what has been said it results that, for the party having compact forces, we may assume conditions of equivalence and also of superiority, with respect to the other that is broken up into groups. Under the hypothesis considered, the advisability

of this last system is not excluded by this, but it is important to hold: (1) that such advisability is to be considered only in regard to the maneuvering; (2) that an echelon of groups in distance would be dangerous.

II. We will now consider the hypothesis that the forces opposing each other are equal, and that each party is so numerous that, in order to be compact, recourse must be had to the double alignment. In order to eliminate the inconveniences pointed out in the preceding section, it is possibly proper to prefer the separation of the forces into two divisions in simple alignment. In Part II we shall consider when the impossibility of doing so exists, or under what relative conditions of mobility maneuvering by groups may expose one to serious risks.

Setting aside the case in which the conditions just mentioned impose the double alignment, this may be advisable when the number of battleships at one's disposition is greater than that with which two groups may be formed in simple alignment; in fact it is well to note that *the greater the number of groups, the smaller is the probability that their movements may be co-ordinated;* and hence, in general, it seems advisable not to form more than two groups (exceptionally three), even at the cost of having recourse to the double alignment.

III. It is to be held as an axiom that, in general, it is not well to divide the fleet into groups of the same importance; rather than have two groups, both of them of small manageability, it is preferable to decide that one of them shall be endowed with special aptitude for the acquisition of advantageous positions. We reserve it to ourselves to develop, in its turn, this idea of the division of the forces into a *principal squadron* and a *flying squadron.*

Summing up, when fleets about equal in strength and not very numerous are opposed to each other, the breaking up into groups can only be advisable in order to obtain the maximum freedom of maneuvering; for numerous fleets, this expedient appears to be preferable to the double alignment. When the breaking up into groups is not rendered necessary simply by this numerical cause, the idea that prompts it may be that of attempting enveloping movements (crossing the *T*) by means of a flying squadron.

On the basis of the ideas advanced, the discussion of the hypothesis that both the adversaries are divided into groups is evidently simple.

turrets and casemates, the occurrence of flarebacks is favored, and the lenses of the telescopic sights may be dulled by spray. Pros and cons also exist if we consider the direction of the wind with respect to the course of the ship. A wind that blows in the direction of the longitudinal axis envelops the range finders and the observers in the tops in smoke. If the wind comes from ahead, with a fleet in column of vessels, each ship is enveloped in the smoke of the preceding one. If the wind comes from astern, the smoke hangs over the ships a long time. It seems, then, that it may be advisable to maneuver without troubling oneself about the wind. Only a ship that has the defect of having guns but little elevated above the sea could have much interest in keeping to windward of the enemy.

The direction of the solar rays may have considerable importance when the sun is only a little above the horizon, because, notwithstanding the colored glasses on the telescopic sights, having to fire with the sun in one's eyes is a grave inconvenience. It is logical to seek to escape from this situation by rotating the line joining one with the adversary in a way that tends to bring the sun at one's back. When the sun's rays make a considerable angle with the plane of fire the aforesaid inconvenience is negligible.

It is well known that the target can better be seen when it is projected upon the horizon rather than upon a coast; it may then be desirable to be between the enemy and the coast, whenever, naturally, the neighborhood of the latter does not interfere with the liberty of maneuvering.

Finally, it is clear that the position of the adversaries considered with regard to strategic centers may be of importance; but this cannot justify long maneuvering out of range, which may cause the risk of losing an opportune occasion for fighting. The candid truth which history shows us is not always remembered, is that the issue of the war depends upon the battles.

CHAPTER IV.

THE FIGHTING DISTANCE.

22. *Uniformity of Distance.*—The problem which we propose for ourselves is that of establishing the criteria proper for determining the most convenient fighting distance, or the *distance of maximum utilization.*

First of all, it is well to discard two methods that may be attractive on account of their facility for furnishing a result; for this purpose let us refer to the simplest hypothesis, that is, of the naval duel.

(1) We might seek the solution by calculating the difference that exists between the two adversaries in the total energy developed by the projectiles on impact. The distance corresponding to the most advantageous value of the said difference would be the distance required. It is clear that such a method would be absurd, since there exists no equivalence of effects with equality of dynames * developed by the different kinds of guns. Aside from this, the method would evidently be one-sided.

(2) We might place the penetrating power of the guns of each combatant in comparison with the thickness of the enemy's armor. But, in this comparison, what shall we hold to be the inclination to the plane of fire? Let us suppose our ship to be at a distance r from the enemy, who is able to pierce the side armor, when the ship presents her beam, with a projectile that, at the above mentioned distance, has a residual velocity v. If, while remaining at the distance r our ship assumes the inclination ψ to the plane of fire (counted from the beam), from what has been said in section 4 (Chapter I), this is equivalent, from the defensive point of view, to be being placed at the distance at which the residual velocity of the aforesaid projectile is $v \cos h\psi$ (where $h=1$); the offensive power, however, remains constant unless the direction ψ is outside of a sector of maximum offense. It is easy to prove that even a moderate value of ψ is equivalent to a material change of distance, which is all the greater the greater is the caliber. Hence, the inclination to the plane of fire cannot be overlooked. Wishing to apply the above-mentioned method, it would logically be necessary to suppose that the adversaries have each other bearing in directions of maximum utilization; then, however, no conclusive result could be reached with ships having large extensions of armor with thicknesses not below 150 millimeters.

In any event, the method which we are discussing would also be one-sided, because, while considering the defensive element (neglected in the foregoing) we should set aside most important elements, to which we will allude.

* Dyname = 1000 kilogrammeters. (Translator's note.)

Methods of the nature above mentioned, even if they could furnish results logically worthy of consideration in the case of two ships opposing each other, or of two groups composed of homogeneous ships, would not be applicable to the case of fleets composed of groups of ships of different types. In fact, these results would be very different for the various types, and then the legitimate consequence of such methods would be to make the various parts of the fleet fight as independent groups, echeloned at different distances from the enemy. So, then, aside from the possibility of always adopting the system of maneuvering by groups, we cannot admit the advisability of the echelon in distance for reasons discussed in section 20; on the contrary, we derive from it that the idea to be assumed as fundamental is that of *the necessity of having the various parts of our fleet fight under conditions of a uniform mean distance.*

In comparison with the system of the echelon, which might give to the tactical employment of the forces a rigidly prearranged form, the idea just enunciated appears the more rational inasmuch as, with it, we at once perceive the possibility of regulating the development of the tactical action.

In virtue of this idea, the question to be discussed appears complex; and it is proper to add that the complexity does not depend solely upon the heterogeneity of the different divisions of the fleet. Indeed, the variables of the problem do not reduce to the weapons and to the protection, but we must take into account strategic factors, and others of a moral and organic nature.

23. *The Strategic Situation and the Fighting Distance.*—The axiom with which we closed the preceding chapter must be recalled here: *The war is decided by means of decisive battles.* Ought we to draw from this the corollary that every tactical action must be pushed to a finish, or that, unless it is developed to the point of obtaining the destruction of the enemy's forces, it is unprofitable?

The question is prejudicial to the subject we have under discussion, since, if the reply is in the negative, on that basis it may sometimes be well for the fighting distance not to fall below a certain limit.

To overcome the enemy is the desire of all who fight, but in some cases a tactical victory may be a strategic defeat. Some particular examples are necessary in order not be misunderstood.

During the first period of the recent war, up to the fall of Port Arthur, the Japanese had to consider that, while the whole of their force was engaged, the enemy, even after the destruction of the first squadron in the Pacific, would be able to send a second squadron from the Baltic. Italy, in case of a war with France, given the present relative conditions of the naval forces, might be found to have a superiority with respect to one fraction of the enemy; we shall, however, have to consider that, if in the victory our forces sustain such injuries as to remain for a long time paralyzed, ours would be a Pyrrhic victory, because the adversary, although having had one of his fractions annihilated, will have acquired liberty of action with the remainder.

On the other hand, at Tsushima, Japan found herself obliged to seek the annihilation of the enemy, because that signified the complete solution of the maritime struggle. Italy against Austria would have to seek to end the struggle by one decisive battle, because, supposing that we have a total superiority of forces, every elimination of equal forces would be to our advantage. England, given the necessity of keeping open her commercial communications, and given also the development of her forces, would have to seek the destruction of the enemy. These examples demonstrate that the axiom which establishes that the object of fighting is to overcome the enemy, admits as a corollary, not the unconditional advisability of a decisive struggle, but *the necessity of pushing the fight as far toward a finish as is permitted by the strategic conditions.*

To establish firmly this postulate, it is necessary to examine the doubts that may be formulated on the basis of the principles of war on land and of naval history.

In the history of war on land it is set down as incontrovertible that the shock of grand masses should be of an exterminating character. To deny this would be to signify the return—as Clausewitz wrote: * "To the systems of warfare that preceded the Revolution and the French Empire, in which there were manifested the falsest tendencies, pretending to aggrandize the military art the more war was deprived of the use of the only means proper to it: the annihilation of the enemy's forces." Such false tendencies consisted "in the pretension of the possibility, by directly seeking only a limited destruction of the forces

* Teoria della grande guerra. Vol. I.

of the enemy, of arriving, by way of wise combinations, at his complete direct enfeeblement; or, in other words, of exercising, by means of small blows ably administered, such an influence over his will as to lead him the more promptly to submit. . . . . The direct destruction of the armed fórces of the enemy must stand before every other consideration."

We observe that in affirming the possibility of having, in naval battle, to consider also the strategic situation, we have not denied the correctness of the axiom concerning annihilation; we have only expressed a reserve under the hypothesis that, after the hostile naval forces that we have confronting us, we must keep ourselves in condition to meet others of them, having at our disposal only our present forces; or under the other hypothesis that we have already confronting us the entire forces of the enemy, but we, on our part, have not a sufficient force to give us the probability of victory in a decisive battle; it may be a case of delaying the battle until the moment in which the enemy offers so vital an offense as to oblige us to stake all against all.

The comparison, then, must begin by being made with the situation of an army, A, which has confronting it a hostile army, B_1, about equal in strength; and which foresees having afterwards to fight also another army B_2. The question to be propounded is this: Does there exist for A the possibility of pushing the fight with B_1 to a finish, and of afterwards finding himself still in condition to oppose B_2? Evidently the reply may be in the affirmative; the annihilation of B_1 may bring great loss to A, which, no matter how great, may not be so important a fraction of the total as to produce incapacity to oppose B_2; the moral advantage acquired will be so great as largely to compensate for the said loss; and then, it will perhaps be possible to fill up the vacancies by drawing upon the great resources in men that modern states possess, given the national character of the wars.

At sea, under analogous conditions, the struggle against B_1—given the fact that it is victorious—*if it has been a fight to a finish*, will inevitably have caused serious losses which will either not be reparable, or will not be so in sufficient time; in other words, either we shall have lost ships, or we shall have them so seriously damaged as not to be able to count upon them when we have need of them.

The difference between the land and the sea depends essentially

upon the fact that on land it is a struggle of men; at sea it is struggle of ships. On land, numbers constitute a great fact at sea we have only a very limited number of units, and eve elimination means the loss of an important fraction of the to

On land, given the nature of the means, we are able to imagi only the fight to a finish or the barren struggle. The same w the case at sea during the sailing period—the condition of th means of war did not permit of efficacy except when fighting close quarters. Under such conditions, the principle that th battle must be pushed to the annihilation of the enemy was necessity; when the conservation of the forces was imposed, was necessary to keep them in a potential state, just as, on lan in an analogous case, there was imposed the necessity of takin a flank position. Great admirals are not wanting to give examples of this—it will suffice to cite some typical cases.

In 1673, Ruyter maintains himself in a state of efficiency behin the banks of Schöneveldt, because his fleet is inferior to that the Anglo-French; in this way he conserves his forces until th time when Holland is threatened with invasion. In the war 1778, Howe, owing to the inferiority of his forces with respe to those of d'Estaing, upon news of the arrival of the latter the American coast, leaves the Delaware in order not to obliged to fight under unfavorable conditions, and goes to ta part in the defense of New York, in a position where the enem does not dare to attack him. And when d'Estaing goes to sup port the troops of Washington in the attack on Newport, How goes promptly in advance to Rhode Island where, on account the prevailing winds, he reckons upon keeping to windward, launching fire ships if the enemy remains in the bay. The pres ence of Howe puts d'Estaing in a critical position, and therefo the French squadron profits by a favorable wind to leave th anchorage, thus abandoning Washington to himself. As Mah observes, "the weaker fleet has fully beaten the stronger virtue of its maneuvers."

To-day, the fact to be borne in mind is that long-range batt has acquired greater efficacy than in the past; and from this follows that by keeping the development of the action within certain limits, it may be profitable to engage tactically, not only in situations analogous to those in which battle was advisable during the sailing period, but also, in part, in others in which

s then necessary to remain in a state of efficiency. It must, n, be acknowledged that, the conduct of the forces being in- red by the postulate which we support, as against the other ich expresses the necessity of engaging only under conditions being able to seek the destruction of the enemy, we shall have increase and not a diminution of the *offensive spirit.*

Ve proceed, then, to seek the solution of the proposed problem the basis of the idea that *the strategic situation may limit the elopment of the tactical action, as long as we have more in- est than the enemy in the conservation of the forces; while ler the contrary hypothesis, it is important to press the fight its decisive phase; which naturally does not signify that it is l to close the distance from the beginning.*

24. *Tactical Zones.*—If the problem could be solved with thods of the kind mentioned in section 22—that is, on the is of numerical calculations—it might be possible to give to distance of maximum utilization a strictly determined value. t the variables to be considered are such that we are not able reach a really logical result except by dividing the tactical d into zones of considerable width, and examining, with re- ct to the zones, the benefits that the two opposed parties can ive from the action. At the present time the subdivision that ms reasonable is the following:

1st zone, distances from 10,000 to 8000 meters (extreme range).
2d zone, distances from 8,000 to 5000 meters (long range).
3d zone, distances from 5,000 to 3500 meters (medium range).
4th zone, distances from 3,500 to 2000 meters (close range).
5th zone, distances less than 2000 meters (close quarters).

The heavy-caliber gun is the weapon of the first two zones; rein the medium guns are of use for the improvement of the ng and for action against unprotected parts; beginning at the per limit of the second zone these guns begin to give notably od results. In the third zone the probability of hitting with medium guns is sufficient for assigning a special value to ir action. In the fourth zone, from what has been said in apter II, the employment of the torpedo is possible. In the h zone it is also necessary to take into account the possibility collision; its limit being assigned according to a criterion of ich we shall speak in Part II.

25. *The Initial Advantage.*—A first datum concerning the rela- e importance to be attributed to the different zones is found

in the following axiom: It is of the highest importance to obtain an initial advantage, because it has a compound influence; that is, it tends to increase the advantage, not only by reason of the material injuries which diminish the enemy's offensive capacity, but also because it produces moral injury and disorder.* In virtue of this, as has already been realized in the Russo-Japanese war, there may be felt by the winner a relative safety which is surprising.

The initial advantagé may profitably be sought, especially in the first two tactical zones, because in them full allowance may be made for exercising control over the fleet; while the further we advance into the successive zones, the more we are under the sway of the unforeseen which reigns supreme at close quarters. In other words, *it is to be held that a struggle at extreme or at long range constitutes an efficacious means of preparation for the struggle at medium or at close range.*

On the basis of the principle thus established, we may be induced to seek battle in the zones within the second by an initial disadvantage, experienced or anticipated. Let us fix the ideas in this connection.

The shorter the distance, the greater is the percentage of effective hits for both the adversaries; but may this variation be considered the same for both? Evidently, no; the difference depends upon individual ability, upon the means at one's disposal, and upon the fire control.

The difference dependent upon the gun laying varies with the firing distance; in fact, at short distances, even a mediocre gun layer fires well; the difference in ability between two gun layers always makes itself the more felt as the distance increases, and when the ship is subjected to rolling movements. So, also, the

* "D'un côté, le commandement, désepérant du succès, tombera dans l'hésitation; il songera à sauver les débris de sa fortune; la direction deviendra incertain; l'artillerie, précipitant son tir pour rattraper l'avantage, gâchera ses munitions; les officiers seront impuissants à diriger leurs hommes.

"De l'autre côté, le spectacle sera tout différent au début de l'action, le courage n'est soutenu que par une effort de la volonté qui enlève à chacun une partie de ses facultés; mais aussitôt qu'on éprouve l'impression que l'ennemi commence à céder, une détente se produit; la confiance succède à l'apprehension. Chacun reprend son sangfroid; le combat devient plus méthodique. . . . . Dès lors la victoire est assurée."—Daveluy.

eater the distance, the more the ability of the directors of the ing affects the results.

With equal ability of the personnel, the better are our range bles, the greater the homogeneity of the armaments of our ips, and the better the state of our weapons, so much the more ay we have confidence in being able to adjust the firing before e enemy can do so, or, to secure the initial advantage.

But, a priori, the elements just pointed out are almost entirely nponderable; the above-mentioned differences will have effective fluence, but they cannot be estimated beforehand. Generally, en, at the beginning of the combat, each of the adversaries will e confident of securing the initial advantage; consequently, *if e one who can impose the distance* (in the manner which we all consider in Part II) *has greater interest than his adversary the conservation of the forces* (section 23), *the action will be nited this phase; otherwise, it will consist of successive phases; ut a phase in the first two zones is logically to be predicted,* except in the cases which we will now point out.

The arguments that can be deduced for maintaining that, without initial disadvantage, battle in the third and fourth zones may e expedient from the beginning, are the following:

(1) Inability to perforate the enemy's armor in the first two ones.

(2) The short life of the heavy guns.

It is to be observed that in the recent war the possibility of btaining important tactical results, even without the effects of erforation, may have been demonstrated.

The importance of the initial advantage being admitted, given e fact that fighting at long range may serve a very useful purose in preparing for the struggle at shorter distances, should e renounce it on account of the wear and tear to the heavy uns derived therefrom? Given the fact that we are disposed to sk the ships by closing the distance, why not also risk the guns battle in the first two zones? The arguments adduced must considered, but not by one of the adversaries alone; we ought t to preoccupy ourselves too much with the wear and tear of e guns, because those of the enemy are worn out equally with rs. It results from this that, while, on the one hand, in the st encounter we fight at long range, closing in afterwards cording to circumstances, on the other hand, in continuing the ar, we might be obliged to fight initially at medium range.

It is well, however, to hold that, having more interest than the enemy in the conservation of the forces, in order to be truly free to choose the tactical zone it is necessary that the choice be permitted by *the state of the ammunition supply and the number of guns in reserve,* which must at least be equal to that of the enemy; an inferiority in this respect evidently may render it necessary to seek to delay the battle until the strategic situation imposes a fight to a finish.

At this point in the discussion, in order to assemble the ideas concerning the interest that a belligerent may have in fighting in one zone rather than in another, let us consider the problem by parts; examining the influence of differences in the means of offense, and that of differences in the means of defense.

26. *Differences in the Means of Offense.*—Let us suppose that there exists between the adversaries a difference in the number, but equality in the kind of weapons.

If, with two opposed parties, A and B (ships or fleets), the first has over the second the advantage of n guns of a certain caliber, with equality in other conditions, the damage inflicted upon B is roughly equal to that sustained by A, increased by that which is produced by the n guns in advantage. Hence it is clear that *the difference in the number of weapons, with equality in the kinds of the same, makes its effect the more felt the more the distance diminishes;* and for this reason, unless an inferiority is so notable as to make it advisable to seek battle at close quarters, it produces an interest in fighting at long range and seeking to compensate for the disadvantage with dexterity.

Let us now suppose that A and B have guns of two kinds; for example, A has n_1 guns of heavy caliber more than B, while B has n_2 guns of medium caliber more than A. Diminishing the distance increases the efficiency of n_1 and n_2 alike; A, however, is interested in not allowing the distance to fall below the inferior limit of the zone in which the action of the heavy caliber is particularly efficacious; hence, for A, the second zone is suitable, while for B, the fourth zone is best, or the lower limit of the third, when it is desired to exclude the use of the torpedo.

In relation to the criteria just enunciated, the following observations are to be made:

(1) A ship, the guns of which are not capable of yielding the same return as those of the enemy (with equality in number and

in kind) on account of the minor dexterity of the personnel, may seem comparable to a ship less strongly armed; then, by applying the preceding criteria, this ship should be interested in fighting at long range, which would evidently be absurd. But the error lies in the comparison made; in fact, logically, the conditions of the said ship are to be compared with those of a hypothetical ship, the guns of which increase in number as the distance diminishes.

(2) Analogously to what has been said under the hypothesis of a superiority constituted exclusively by medium guns, in order to utilize to the maximum degree a superiority in heavy and medium guns, battle in the third and fourth zones would seem to be advisable. However, the importance of the initial advantage is to be taken into account, and the expediency of avoiding, as far as possible, having the superiority compromised by lucky shots. Consequently, at the beginning, long-range combat is preferable, passing afterwards to medium range, and finally to close range, in order to give the *coup de grace*. The combatant that gets the worst of it in the artillery battle, if he has not the possibility of imposing a fight at close quarters, will decide to launch torpedoes at long range. For the adversary, that might be the opportune moment for diminishing the distance and launching torpedoes without too many risks and with greater probability of success.

27. *Differences in the Means of Defense.*—On the basis of what we have noted in section 4 (Chapter I), a good distribution of 150 millimeters armor constitutes the *minimum* sufficient and necessary for the struggle at extreme range and at long range against ships armed with guns of heavy caliber. Aptitude for battle at shorter distances requires a thickness greater than the said limit, at least in the water-line belt. These criteria seem sufficient for estimating the influence that the relative conditions of protection of the adversaries may exercise upon the choice of the distance.

Ships with but little protection, but with great offensive power, may be employed against the secondary (unarmored) forces of the enemy, and also—if deemed necessary—against the principal forces, taking care to safeguard them in the manner indicated in Chapter III; in which case, however, the choice of the opportune tactical zone for the whole fleet is made independently of the presence of such ships.

Aside from this hypothesis, ships with little or no protection should avoid battle with strongly protected ships; but, when obliged to fight, they should seek to come to close range.

28. *Conclusions.*—On the basis of the preceding analysis, let us sum up for each tactical zone the conditions under which it may opportunely be selected.

Zone I is suitable for the search after the initial advantage, for the combatant that, by reason of the strategic situation, can least afford to risk his forces. It requires great organic preparation of the personnel and of the material. It is generally not capable of producing decisive effects, but is capable of accentuating differences.

To the one who desires to push the fight to its decisive phase, this zone would not be suitable when he cannot count upon a sufficient number of hours of daylight.

Battle in this zone is not possible except under the best weather conditions.

Zone II.—The combatant in the strategic situation above mentioned will pass to this zone after obtaining an initial advantage in the first zone, unless, having a greater number of heavy guns, he elects to develop the entire action in the latter. It will be the one in which, generally, the initial advantage will be sought by the combatant who desires the battle to take place in its various degrees of intensity. It is capable of decisive effects. Generally, both the adversaries will agree in desiring a prolonged phase in this zone.

Zone III is suitable for the one who obtains the advantage in the preceding zone, or who has an important superiority in medium-caliber guns, or heavy-caliber guns in bad condition.

Zone IV is generally suitable for giving the *coup de grace*, or when one has superiority in torpedo armament, or when one has ships more heavily armored than those of the enemy.

Zone V is not suitable for the one who has obtained advantage in the preceding zones. Whoever may wish to attempt a desperate stroke in order to re-establish his chances in the fight, will seek to enter this zone.

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AMERICAN PRIVATEERS AT DUNKERQUE.

By Henri Malo.

Translated from the French by Stewart L. Mims.

I

In the month of February, 1778, about eight days after the signature of the treaty of the Franco-American alliance, Lamotte-Picquet, who had just cleared the coasts of Gascony and of Annis of English privateers and then cast anchor in the roads of Quiberon, fired nine salutes which awoke an echo throughout the world. It was the response to the salutes of the *Ranger*, an American privateer, commanded by Paul Jones. Since the signing of the treaty, this was the first official act of recognition by a European power of the star-spangled banner of the United Provinces of North America.[1]

Much before this date, however, during the two years that Louis XVI was hesitating to declare an inevitable war, American privateers had begun to frequent the coasts and ports of France. The French marine lost during these two years of hesitation 158 vessels, representing a value of 16,500,000 francs, which the English captured before the rupture of diplomatic relations. The pursuit of rebel privateers and of vessels suspected of carrying arms, ammunitions and money to America was the pretext seized by the English to make these captures, and to cruise along the coasts of France and to exercise patrol even in the harbors of France. In contrast with the king, the country did not hesitate to declare its opinion. It is well known with what enthusiasm Lafayette crossed the Atlantic. People in the ports gave evidence

[1] Lacour-Gayet, *La Marine militaire de la France sous le règne de Louis XVI*, Paris, 1905, p. 106.

of similar enthusiasm for the American cause. Their connivance and ofttimes that of the Admiralty as well were necessary to render possible the equipment in France of American privateers. Almost none of the American privateers which cruised in European waters were actually armed in America, most of them being armed in ports of France. The lust for gain explains, of course, the ardor of merchants to furnish arms and ammunition to the rebels, for the English government had endless trouble in preventing English merchants from carrying on the same traffic. England, however, protested against the conduct of the French, which will be recounted below.

The rôle played by the American privateersmen who sailed from the ports of France has not been made known. The story has been told of some of the diplomatic incidents which their acts raised during the period of strained relations from 1775 until the declaration of war in 1778, but no one has even called attention to the rôle which they played during the war. Maclay makes no allusion to it.[2] Their activity, however, is far from being a negligible quantity and it is that which will form the subject of the present study.

Our researches have been confined for the most part to the local archives of Dunkerque.[3] In that port privateering was traditional. Its population was particularly resentful against the English, for the residence in their port of Major Frazer, an English commissioner, had been imposed upon them by a clause in the treaty of 1763 which forbade any improvements or fortification of the harbor and gave the right to the English king to maintain a commissioner at Dunkerque to assure its enforcement. Furthermore, the exceptionally strategic situation of the port and the exemption from compulsory service in the marine for sailors of all nations were advantages which were peculiarly fitted to attract the citizens of the United States who wished to carry on privateering in the waters of Europe. It was at Dunkerque, in fact, that they first appeared and became numerous.

[1] Chevalier, *Histoire de la Marine française pendant la guerre de l'Indépendance Américaine*, Paris, 1877, p. 66.

[2] Edgar Stanton Maclay, *A History of American Privateers*, London, 1900.

[3] Archives du Greffe du Tribunal de commerce, Arch. de la Ville, Arch. de la Marine.

Some idea of the importance of their activity in that port may be gained when it is stated that, after the King of France officially accorded them permission to frequent the French ports, out of a total of 150 privateers registered at the Admiralty of Dunkerque as having made cruises during the American Revolution, no less than 78 were under the command of Americans. Six of the 78 had letters of marque from Congress. All the rest sailed under the French flag and under the authority of French commissions, for the French government was not slow to recognize the serious inconveniences to be encountered in permitting privateering under foreign commissions, for French subjects could thereby escape from the jurisdiction of the French Admiralty and disregard the regulations thereof, and it accordingly forbade the practice. The total value of prizes [3] captured by privateers of Dunkerque during the American Revolution amounted to 25,000,000 francs, of which the share captured by American captains amounted to 12,500,000 francs. Among the 47 American captains who commanded these expeditions, six won such high distinction as to be recognized by the French court in investing them with the brevet of lieutenants of the king's frigates. The names of the six are Patrick Dowling, William Fall, Kenny, John Moultson, Bennet Negus and William Ripner. We shall have occasion to meet some of them in command of vessels of the division of Castagnier in the French Revolution. One of them, John Moultson, was placed in command in 1792 of the division stationed at the mouth of the Schelde.

These facts prove the importance of the study which we propose to make.

* * *

Vergennes, Minister of Foreign Affairs under Louis XVI, had not forgotten the début of the war of 1755. The first rumor of the armaments which the British Admiralty began to make found him alive to the situation. In July, 1775, he wrote,[4] "The experience of the past should put us on our guard, and we should not like to be taken for dupes a second time." On September 25 Sartine,

[3] It is a question here of the net proceeds, which were always inferior by a half to the amount of damage inflicted upon the enemy and from which, besides, 20 or 30 per cent had already been deducted for expenses.

[4] Doniol, *Histoire de la participation de la France à l'etablissement des États-Unis*, Paris, 1886, Vol. I, p. 96.

Minister of the Marine, on receiving the news that the English intended to confiscate all vessels which came from New England to Dunkerque, at once demanded explanations from the English government.[1] Almost at the same time the question arose as to the sending of arms and ammunition to America. D'Anglemont, the general commissioner of the marine at Dunkerque, received orders to prevent their expedition, but was told to employ "the greatest possible reserve in such a way that no one should know that any reserve was being made or that precautions were being taken."[2] A circular letter of November 16 repeated the defense. Sartine accompanied the circular with this commentary: "If on the one hand the government is very glad to give a proof of its good-will toward the English by impeding the traffic which Americans might carry on in our ports for the exportation of arms and ammunition, it is on the other hand equally anxious to favor commerce and place as few obstacles in its way as possible. I count too much upon your sagacity to make it necessary for me to enter into a more detailed explanation, and I have too much confidence in your intelligence not to rely upon your circumspectness in a situation which can become so delicate. You should keep the matter secret, I may add, and especially as regards what I have just said."[3] It is not surprising that shortly afterwards we find Lord Stormont, the English ambassador, demanding a renewal of the prohibition to export arms and ammunition to America. The French government acceded to his demand. Thus Sartine wrote to D'Anglemont on December 9 as follows: "His Majesty, desiring to give to the King of England a most convincing proof of his sincere friendship, has commanded me to recall to your attention the orders which I have already sent you not to permit either upon English vessels or upon those of any other nation the expedition of arms and ammunition to North America." The *armateurs* continued without difficulty their expeditions. Three weeks later Lord Stormont took the matter up again. This time he demanded that the exportation of munitions of war be prohibited *for all destination whatsoever*. Such a demand had, of course, no chance of being received favorably. Sartine replied as follows: "We cannot restrain our commerce to that degree. His

[1] Arch. Mar. Dunk., B 2, reg. 6, Letter to de Villers.
[2] *Ibid.*, 16 October, 1775.
[3] *Ibid.*, 27 November, 1775.

Majesty has already given a sufficiently striking proof of his friendship for the King of England by prohibiting the exportation of arms and ammunition to the English colonies. I am persuaded that this consideration has not escaped you." [10]

Although renewed in April and again in September the prohibition to export munitions of war to the English colonies remained ineffective.

The presence of American privateers in French ports was a subject of very warm protests by the English and on different occasions placed the cabinet of Versailles in great embarrassments. The English diplomats found clauses in the treaties upon which they based their protests. Louis XVI, although he intended to protect his own rights, intended also to respect scrupulously "the principle of fidelity to treaties."

On April 3, 1776, Congress formally authorized privateering.[11] The English at once seized upon this as a pretex to stop French vessels upon the sea [12] and to push the equipment of their vessels with more energy than ever before. Parliament was asked to pass an act which would authorize privateering for British subjects (December, 1776). The news of this fact aroused great emotion in France, for the consignments for America which were being prepared in French ports were thus placed in great danger. Vergennes wrote to Marquis d'Ossun in regard to the matter as follows: "It is an unfriendly act against the commerce of all nations, for, if one supposes that it is really only a matter of permitting privateering for the capture of American vessels, it is very easy to see that if privateersmen, who become combatants only to satisfy their desire for gain, do not find legitimate means of recovering their advance of funds, or of satisfying their avarice, they

[10] *Ibid.*, reg. 7, 4 January, 1776.

[11] Maclay, *op. cit.*, p. 132, prints the "Instructions to the Commanders of Private Ships or Vessels of War which shall have Commissions or Letters of Marque and Reprisal, authorizing them to make captures of British Vessels and Charges," and on p. 218 he reproduces a letter of marque.

[12] A Cherbourg captain was stopped at about three *lieues* to the northwest of Ouessant by an English vessel which demanded him to tell the news of what was taking place at Brest and Rochefort. The captain replied that he knew nothing. The English officer remarked in quitting him that he was in search of vessels from New England (Arch. Mar. Dunk., B 2, reg. 7). It became the habit shortly afterwards for the English officer to take such a French vessel captive.

d and were defeated. In October he was again cruis-
ston when he captured a ship with a rich cargo of rum,
cotton." Once in possession of the *Admiral Pocock*,
am rebaptised her with the name *Surprise*, and then
n as his second and a letter of marque of Congress in his
set sail under the disguise of a bona-fide smuggler.
orrow he threw off his mask, hoisted the American flag
to cruise at the mouth of the Meuse. On May 2 he
in succession the packet *Prince of Orange*, en route
wick to Hellevoetsluis, and the 110-ton brig *Joseph*, en
n Messina to Hamburg with a cargo of wine, lemons
ges. He placed the crew and passengers of the packets,
with their jewelry and personal effects, aboard a Dutch
ssel, and the crew of the brig aboard another fishing
nd for Nieuport. Cunningham then made way for Dun-
th his two prizes. When he arrived there, two English
ouled him intentionally in order to damage his vessel.
lt his ship sprang a leak.

gham presented himself in haste at the Admiralty bur-
ake his declaration and to claim an inspection of his
It was of importance to proceed with haste to the de-
on of the damages which his vessel had suffered, because
e risk of forfeiting after the lapse of 24 hours, his two
Book 3, Art. 14, title 9 of the ordinance of the marine
No vessel captured by captains under a foreign com-
an remain more than 24 hours within our ports and har-
ss retained by stress of weather or unless the capture has
e upon our enemies." Official inspection was made on
nd the verbal process, establishing the damages caused to
vessels, was dressed and granted to the privateer the
repairs and the permission to dispose of her two prizes.
meantime the captain of the *Joseph* had filed protest with
h consul at Ostend and a diplomatic correspondence had
regard to the matter. Sartine addressed an order to
mont on May 8 to arrest Cunningham, Beach and their
hold their vessel captive and to release the two prizes.
omplained of the fact that his subordinates had failed to
n of what had taken place. The captain and crew of the

, *op. cit.*, p. 72.

to the welfare of the port. You will take the trouble to inform me exactly, even to the most minute detail, of all which you can learn of any such armaments, and you will take all pains to check from the very beginning anything which might prove a violation of our treaties and of the intentions of the king."[18]

On June 8 the minister admitted that one could not prevent one of the cutters in question to sail from the port as an ordinary smuggler, but that on the other hand it could not be allowed to sail under the American flag. The cutter was being laden, so it was said, by one William Hodge for Ireland, but with a large cargo of ammunition. The two cutters were the *Surprise* and the *Revenge*. Seventeen sailors were being enrolled at Calais for the former, when Sartine wrote "if it were such a good sailor the king would buy it." The minister renewed his orders to prevent either of the vessels to sail. Whereupon the *Surprise* was sold by an Irishman to Dominique Morel, a widow, and the *Revenge* to Richard Allen, an Englishman. The Admiralty of Dunkerque considered the sale of the former suspicious, but raised no objections to that of the latter. Permission to sail was refused to the *Surprise*, but accorded to the *Revenge*, whose destination, according to its passport, was Bergen in Norway. "An assurance and bond that this vessel would not be used as a privateer and would not take any Frenchmen aboard" were demanded of both the buyer and seller.[19]

The *Revenge* was no sooner upon the sea than Cunningham took command. He attacked and captured several English vessels. One of them, with apparently the richest cargo, was rescued from its captors. Out of 21 who had been placed aboard this prize to man her, no less than 16 were Frenchmen. Much later Cunningham pretended that once upon the sea he found aboard his vessel a large number of volunteers who had been enlisted by Webb and not by him, and who had been embarked at night in order to escape the inspection of the commissioner of enlistments, who would have refused them permission to embark. Many of these volunteers had never been upon the sea before and were consequently in the way and consumed rations without rendering any service. He got rid of them by placing them aboard the aforesaid prize, which fell into the hands of the English. Three years later

[18] Arch. Mar. Dunk., B 2, reg. 7.
[19] Doniol, *op. cit.*, II, 497.

hindered trade, for their principal object was to find English vessels anchored in French ports and to seize the chance to capture them at their sailing. As such conduct was contrary to treaties, he ordered de Villers to notify the said privateers that they could no longer remain at Dunkerque. De Villers was also ordered to pass in review the crews of the privateersmen, in order to find French sailors, and not to suffer prizes to remain in the port beyond the time prescribed by the ordinances, and finally to warn the privateersmen that if they returned to French ports they would be disarmed.[22]

Upon their arrival in Europe, the commissioners of Congress, Benjamin Franklin and Silas Deane, saw at once how important it was for the triumph of the American cause to attack the English in their most vital spot, namely, their commerce. Cunningham had already begun his cruise as a privateersman when Franklin wrote from Paris, May 26, 1777, to the Committee on Foreign Affairs as follows: "I have not the least doubt but that two or three of the Continental frigates sent into the German Ocean, with some less swift-sailing craft, might intercept and seize a great part of the Baltic and Northern trade. One frigate would be sufficient to destroy the whole of the Greenland fisheries and take the Hudson Bay ships returning."[23] These suggestions were promptly acted upon. Not having frigates available, the Marine Committee sent two cruisers, *Reprisal* and *Lexington*, which were joined in June by the 10-gun cutter *Dolphin*. These three vessels made the complete circuit of Ireland twice and captured 16 prizes, which they brought and sold in French ports. The proceeds thus realized furnished to the commissioners useful funds with which to plead their cause in European courts.

As soon as he learned of these facts, Vergennes addressed to Franklin and his colleagues an official note entitled "Notification given to the commissioners of the United States of the prescriptions which have been addressed to the officers of the Admiralty and to the Chambers of Commerce in regard to privateering." The text of the note is as follows:

Sirs, You cannot forget that in the first conversation which I had with each of you I assured you that you would find in France both a respect for your persons and all the security and facilities of residence which are guar-

[22] Arch. Mar. Dunk., B 2, reg. 7, 10 July, 1777.

[23] Maclay, *op. cit.*, p. xi.

In their reply to this letter, which was written on the morrow, the American commissioners said:

> It is for us a cause of much vexation that a vessel of war belonging to our country, either by ignorance or by inadvertence, has offended even in the smallest measure His Majesty. The captains Wickes, Nicholson and Johnson have explained to us their return to France by saying that they were chased in the channel and blockaded in our ports by English men-of-war, which we have no reason to doubt as the *Reprisal* in particular was forced to throw its cannon overboard in order to facilitate its escape . . . . We shall communicate the orders of His Majesty to our friends who are in French ports, and we shall inform Congress of them, in order that our vessels of war may be warned of the consequences which will result from an infraction of these orders.[31]

Lord Stormont had already on the 18th made quite a scene in his interview with de Vergennes in regard to the matter. Although Vergennes admitted that the conduct of the American privateersmen was intolerable, he refused to accept the demands of the English ambassador for a restitution of the prizes, on the formal plea that there were no grounds on which such a procedure could be made. As to any other action against the captors, "I hope," he remarked to Marquis de Noailles, "that too much wisdom will be shown to make a similar proposal."[32]

The affair of the *Revenge* caused much more disturbance in England than that of the others. The fact that French sailors were found among its crew "made the English ministers cry out aloud." The cabinet of St. James became persuaded that there was connivance between the cabinet of Versailles and the American commissioners. "Very far from the existence of such a thing," so Vergennes wrote to d'Ossun, "the king, who has been very much offended by these procedures, has ordered the lieutenant of his Admiralty at Dunkerque to give an account of his conduct, which is so diametrically opposed to the orders which he has received, and he has ordered the arrest of the buyer and seller, both of whom gave bond that the vessel would not be used for the purpose of privateering. The seller, Sir Hodge, is already prisoner in the Bastille. We are awaiting news from Dunkerque as to the arrest of the buyer. Such is the true state of this affair which seems to stir up such violent resentment in England, the consequences of which I am as yet unable to foresee. The fear of a

[31] Doniol, *op. cit.*, II, 520.
[32] *Ibid.*, p. 514, 19 July, 1777.

disturbance may have caused the Admiralty to permit the privateer to sail—or it may be that the Admiralty is not responsible at all for the embarkment of the French sailors who were found aboard the recaptured prize. Sailors enjoy great liberty at Dunkerque, the harbor and coast are not patrolled and nothing is so easy as to embark sailors on a vessel under sail outside the port." [56]

The French ministers did their best to prevent the occurrence of facts which would justify English complaints, but the sharp practices employed by the *armateurs* to conceal the real destination of their vessels could be detected only with much difficulty. In the month of August, 1777, a cutter, *L'Expédition*, was being armed at Dunkerque evidently as a privateer, but it was impossible for Sartine to determine against whom it was to be directed. He finally gave orders to prevent it from sailing in any case. "whether it be a vessel equipped by some Americans against the English or by some English against the Americans." [57]

However great may have been the irritation of the English, it was no less great among the French, and the government attempted to calm it among the people. "You will see, Sir," [58] by the inclosed copy of a letter from M. de Guichard, late commander at Dunkerque, the excess of English insolence. We have judged it prudent to conceal our resentment and have contented ourselves with sending a frigate and a corvette to insure police patrol in the road." The English had sent some of their ships there much before. As early as May 12, André Marin, a coasting pilot, who had been sent by the orders of his superiors to pilot an English brigantine with a cargo of coal, decided to enter in the port (of Dunkerque). In the road, near the harbor buoys, were anchored two vessels of the British royal marine. Both of them fired shots at the brigantine, which was obliged to lay to and submit to an inspection of its papers. On the 26th, the Admiralty officers noted that the vessel of the King of England, *The Ranger*, Captain Vernon Gates, "the same which had fired on an English vessel entering in port on 12th inst.," had returned and an-

[56] *Ibid.*, pp. 497-498 and note; Vergennes to d'Ossun.

[57] Arch. Mar. Dunk., B 2, reg. 7, 18 August, 1777.

[58] *Ibid.*, and Chambre de Commerce, Reg. Délibérations XLI, f. 122 and 129.

chored at the same place.[29] This practice was continued uninterruptedly. In July the *Speedwell* and the cutter *Wils*, both of the royal navy, cast anchor in the road with the design of intercepting and of burning, if possible, the cutter *LeLévrier*. The strongest cutter in the British marine was scheduled to come and join them. Two English officers, one a lieutenant from the *Speedwell* and the other a lieutenant from the *Wils*, were bold enough to come ashore, under the pretext of seeking provisions, in order to obtain information in regard to the vessel which they were lying in wait for. But they were no more able than the officers of the king to prevent *Le Lévrier* from sailing. Once upon the sea that vessel took the name of *Revenge* and began under the orders of Cunningham to cruise as we have already recounted.

It was at this time that the French government sent to Dunkerque the corvette *l'Étourdie*, commanded by the Chevalier Bernard de Marigny, and the frigate *La Danaé*, Captain de Kergarion, which was replaced on October 30 by *le Zéphir*, Captain de Bavre.[30] At the same time, however, the king, Louis XVI, charged Sartine to notify the Chamber of Commerce that he was firmly determined to respect "the principle of fidelity to treaties." He renewed the orders not to permit prizes and foreign privateers to remain in the ports of the realm longer than the time regarded as absolutely necessary to insure their safety. The king was very well aware of the tricks resorted to by traders in order to obtain the merchandise in the cargoes of prizes, such as false contracts, changing the name of vessels, disguising and changing the destination of cargoes, etc. He therefore ordered that nothing be bought from the cargoes of such prizes either directly or indirectly. Orders were given to prosecute any infractions of this regulation.

The English profited from these measures to capture as many French vessels as possible. We have already indicated the above proportions which their captures attained. This time it was the cabinet of Versailles which complained with the greatest vivacity. The English government replied by promising the creation of a special commission to judge the appeals from such confiscations. French *armateurs* had only to address their complaints by procuration (31st October, 1777).[31] Almost at the same time the

[29] Doniol, *op. cit.*, p. 497, Vergennes to d'Ossun, July, 1777.
[30] Arch. Greffe Trib. Com.
[31] Chambre de Commerce, Reg. Délib. XLI, f. 146.

armateurs of Dunkerque learned that one of their vessels, *L'Aimable Reine,* had just been captured by the English on its return from Martinique.[28]

At the commencement of the year 1778, events began to take place with great rapidity. France and the United States signed a treaty of alliance. Marquis de Noailles and Lord Stormont were recalled by their respective governments. The Admiralty officers of Dunkerque hastened to inquire as to the conduct which they should maintain in the future in regard to American privateers. The reply was made that "in conformity with the treaty of commerce and friendship, which had been made with the United States of North America there could (can) be no difficulty in receiving these vessels in our ports and that the intention of His Majesty was (is) that they be treated with the greatest favor." [29]

Thus Louis XVI had finally authorized his subjects to arm privateers against the vessels of His Britannic Majesty. He published "A regulation concerning the prizes which French privateers conduct into the ports of the United States of America and those which American privateers conduct into the ports of France." The clauses of this regulation provided exactly reciprocal advantages. Thus the privateersmen of each nation were to enjoy the privilege of conducting their prizes into the ports of the other; formalities were prescribed which should be observed in regard to the length of sojourn, to the sale of perishable merchandise, to the final disposition of prizes, to the expedition of papers of procedure to the general secretary of the marine, to special cases of liquidation, and finally to the surrender of prisoners who had been guarded and nourished at the expense of the government whose subjects had made the capture.[30]

A mutual understanding and aid were henceforth complete and effective between the two countries. That is why we fail to find after this date further American armaments at Dunkerque, but instead many French armaments confided to American captains whose brilliant work we are to see in the following pages.

[28] Letter from Capt. Berthelot from New York, November 7.

[29] Arch. Mar. Dunk., B 2, reg. 8.

[30] Arch. Ville Dunk., 201.

II

The American captains were followed to Dunkerque by a large number of sailors from their own country. Their crews were composed, as was the custom among corsairs, of men of all nations, but their compatriots were in a large majority.

It resulted from this that, although most of them adopted the current practices of privateering in their contracts for armament and other matters, about a third of them enlisted under varying contracts which differed from the ordinary.

Ordinarily the *armateur* and investors bore the expenses of the equipment of vessels, of necessary advances of money, of repairs, of disarming the *privateers*. The crews received monthly wages. The sums gained from the sale of prizes and ransoms were divided in thirds, two thirds going to the *armateur* and investors and one third to the crew. The *armateur* received in addition a commission which amounted ordinarily to 2½ per cent on all negotiations.

Another form of contract, which was called "contract of free-booters," was as follows: All expenses were shared in common by the *armateur*, investors and crew, the total of which was deducted from the sums gained by the sale and ransom of prizes. The profit was then divided into two equal portions, one for the *armateur* and investors, the other for the crew, who received no monthly wages. The amount yielded by the sale of the vessel employed in such an expedition and sold at its completion was counted in the total to be divided.

The contracts are in two languages arranged in parallel columns. The *armateur* signed the French text and the sailors the English text. The following is a typical example.

Engagement of the crew of the lugger, *Fleur-de-Mai*, armed by M. Aget and commanded by Patrick Dowling, Esq., under the commission S. A. S., Mgr. l'Amiral for a privateering expedition of six weeks against the enemies of the State.

We hereby by these presents engage ourselves to six weeks of effective service on the sea aboard the good lugger, *Fleur-de-Mai*, mounting two guns and 14 swivels and ordinary firearms, armed in this port of Dunkerque by M. Aget, *armateur*, under the commission in war of S. A. S., Mgr. le Grand Amiral de France, under the command of Patrick Dowling, Esq., to give chase to, to capture, to hold in ransom and to destroy whatever vessels possible which are the property of the enemies of His Majesty, the King of France.

We hereby promise to be faithful to our oath of alliance to the King of France in our quality of citizens of the United States of North America,

and to fight against the subjects of the King of Great Britain and of Ireland, to obey the orders of the aforesaid Capt. Patrick Dowling, each in his capacity specified and regalated in the roll of the crew which will have been made by the commissioner of the marine in this port.

We agree and promise to make the aforesaid cruise of six weeks entire upon the sea, without counting the time which we shall pass in roads and harbors for whatever reasons that may be and to do our best to render this cruise as profitable as possible to all parties interested.

We agree and recognize that the above armament is made under the form and denomination of contract of freebooters, by which after deduction shall have been made for the total amount expended for the purchase and armament of the vessel, the outlay of funds, we shall receive one-half of the sum yielded by the sale of prizes, ransoms and captures whatsoever.

Likewise all expenses occasioned by the disposition of prizes, ransoms and captures, as also those which our vessel may incur, which should be paid, half by the investors and half from the net sum realized from prizes and ransoms which we shall have made, shall be divided equally between the owner of the vessel and the captain, officers, sailors and others of the crew. As for our half, it is to be divided among the crew as specified below.

After the cruise shall have been finished, the aforesaid lugger shall be sold and the proceeds divided as stated above.

We hereby promise also to pay and reimburse M. Aget for the loans of money which he may have made us to satisfy our needs. The said payment is to be made from our individual shares in the proceeds of the first captures made by us, because according to the terms of this agreement we are to receive no wages and can under no consideration make any claims thereto.

Made under our signatures at Dunkerque, this the 19th day of May, 1780.

The tonnage of the vessels confided to American captains varied from 10 to 300 tons. We do not take into consideration the small vessels of 3 tons and even less which were the object of impromptu armaments in order to attempt some sudden adventure. The number of men in the crews varied proportionally from 10 to 220. Inasmuch as they did not know these captains lately arrived in the port, the *armateurs* at first confided only small vessels to their command, thus risking only small capital, but very shortly they did not hesitate to increase the importance of the armaments and to entrust them into the hands of those who gave proof of courage and skill.

The lugger *Serpent*, for instance, under the command of Jonathan Arnold, gauging 30 tons, was manned by a crew of 11 men and armed only with common firearms. Cruising during a bit of bad weather off The Downs, Arnold placed most of his crew in a large row-boat, which he sent toward the shore in order to surprise

some vessel. The community of language made the attempt much easier. But the boat struck a rock and filled with water. The crew gained the shore. Arnold being thus abandoned regained Dunkerque in his sloop with only one of his men aboard (30th May, 1782). No other *armateur* was willing to confide a vessel to him after this experience.[a]

Defective armaments were rare. We have found almost none except that of *Le Petit Commandant,* Captain William Ripner, which was unable to carry four of its guns, because they were found to be too feeble and too long, and his skiff, because it was too long.

A specimen of a strongly armed vessel is *La Marquise de Castries,* placed under the command of William Fall, lieutenant of the frigate of the king (November, 1782-January, 1783). This vessel was a brigantine, a clinker-built vessel of Boulogne and previously called *La Princesse Noire,* of 300 tons, mounting twenty-two 9-pounders, two 6-pounders, four 12-pound howitzers, six swivels, 109 ordinary guns, 25 blunderbusses mounted on iron-crutches, 81 sabres, 61 pistols and 99 grappling-hooks.

It had a crew of 163 men and was equipped by Poreau, an *armateur.* The items of expense of the equipment of this vessel were as follows:

	liv.	s.	d.
Purchase of the vessel	65,000	0	0
Repairs	72,517	11	4
Lodging	36,339	8	10
Sums advanced	49,490	0	0
Sundries	3,188	5	6
Idem	683	12	0
Provisions	24,850	18	1
Outlays	2,650	2	9
Total	254,719	18	6

Armaments of this nature were much more expensive, but they yielded the greatest profits. The smaller armaments proved, as a general rule, less effective to such a degree that the government forbade the enlistment of regularly enlisted sailors in their crews in order to prevent, so to speak, a benevolent surrender of them to the enemy.

[a] Arch. Greffe, Rap. de guerre, f. 6.

We have said that the net product of prizes made by Americans amounted to a total of 12,500,000 livres. Among the captains who had the largest shares in this total were the following:

	liv.	s.	d.
Thomas Maccatter	1,820,280	0	1
John Moultson	1,397,890	1	4
Bennett Negus	1,539,035	12	0
Patrick Dowling	1,535,657	1	8
John Kelly	889,784	11	4
William Fall	793,669	5	3
Luke Ryan	675,521	13	5
Richard Boorn	569,597	14	3
William Ripner	463,816	7	8

Twenty-five of them finished their cruises without capturing any prizes. Twenty were made prisoners by the enemy, of whom two were rescued by their crews. The report made by Captain John Smith tells how he effected the rescue of his vessel, *Resolution*, which was small, having a crew of only 13 men, and armed with simple firearms. It had been armed at Calais by Gamba and Archdeacon. Having sailed on February 27, 1781, he was chased during four hours on March 3, near Harwich, by an English revenue cutter, which overtook him near Northforeland and forced him to run down his colors. The revenue cutter was armed with four 6-pound and two 4-pound guns and 10 swivels, and had a crew of 18. The captain forced Smith and his crew to come aboard his ship, and he placed a crew of his own men aboard the *Resolution*. Smith, soon afterwards noticing that his captor was not on his guard, passed the word to his own men. All agreed to make the attempt to capture the vessel, which they succeeded in doing. They then recaptured their own vessel. In the action, Smith lost his letters of marque and other papers and did not notice (at least he so affirms) that the crew of the cutter escaped to the coast in their skiff. He re-entered triumphantly at Dunkerque with his vessel and prize, *Swift* by name, which had a cargo of gin and tea and yielded 26,413 liv. 14 s. 10 d.[*]

The proportion of corsairs captured by the enemy is relatively great. The captains for the most part offered very little resistance when they encountered much superior force. At the first summons they surrendered. There are 16 who on the contrary never hesitated to fight bravely and even to court great risks. It

[*] *Ibid.*, f. 153, v°.

is interesting to note that, with about one exception, which was due to particular circumstances, it was their cruises which yielded the largest profits.

The *armateurs*, like all brokers, attempted to attract investors by proposing an affair under the most seductive aspects. Thus they sent an enticing prospectus to persons who were likely to take shares in their armament. A prospectus of this nature signed by Gaspard Morel is valuable from the fact that it enables us to see the innovations introduced by the Americans in the equipment of privateers, for it makes special mention of these innovations as being advantageous and economical (25th July, 1780). An extract from it is as follows:

> The war in which the Americans are engaged against their métropole has forced them to seek the means of resisting English forces by armaments which would not be expensive, but which would be capable of rendering their vessels formidable to the enemy either by superior speed in sailing or by the protection of a strong artillery capable of being utilized advantageously. They have devised the construction of pilot boats, which is recognized to offer great advantages and which will be employed in the expedition which is being planned for the near future. Instead of equipping the privateer [57] after the European manner with twelve or fourteen 3-pound guns, it will be armed with five 6-pounders and five 1-pound swivels, which can be put in action from either side of the vessel and with a rapidity twice as great as cannon mounted in the accustomed way. For this reason the five 6-pound guns will do the work of ten. In addition to this remarkable advantage, the crew will remain invisible. This fortunate provision offers security to the sailors, which, united to other advantages which have been tested by experience, justifies the greatest hopes of success.[58]

The first *armateur* of Dunkerque who employed Americans as corsairs and hastened to profit from the fact that they were foreigners was Sir Jean Torris. As early as October 6, 1779, he had drawn up a "contract for the armament of foreign vessels." Among the signatures of the interested parties are to be found those of three American captains who made themselves well-known during the course of the war. The crews of the two vessels, mentioned in this contract, were to be composed of American and Irish sailors. Torris had previously demanded from the government the authorization to enlist about thirty among the

[57] It was the *Jeune Dunkerquoise*, 66 ft. keel, [illegible] ft. overall, 18 ft. abeam, 9 ft. draught, with a complement of 60 men [illegible] 600,000 livres.

[58] Arch. Ville Dunk., 205.

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prisoners taken on board English vessels. Permission was accorded to do so only so far as Americans were concerned. At first he did not find a sufficient number. As for the Irish, "the six who propose to return to England aboard a vessel which they had bought, prove that one can count upon their fidelity." Besides the minister was unwilling to diminish the number of prisoners which could serve for exchange.[a] He had other motives for interference in the affairs of Sir Torris. The text of the contract shows this at the first glance. It is as follows:

Contract for the Armament of Foreign Vessels

Two American cutters, the *Black Prince*, mounting sixteen 3- and 4-pound guns and 32 swivels, under the command of Capt. Patrick Dowling and the *Black Princess*, armed with eighteen 2-, 3- and 4-pound guns, and 24 swivels, under the command of Edward Maccatter, both at present at Dunkerque with a commission of the Congress of the Thirteen United Provinces of North America for a cruise of three months' duration against the enemies of the aforesaid United States, which they are to pursue in partnership, the crews having agreed that they will divide the proceeds of all prizes and ransoms whatsoever, whether made by the vessels acting together or separately throughout the entire cruise.

Jean Torris, Esq., merchant in this city of Dunkerque, the sole *armateur* having charge of the affairs of the two cutters, the *Black Prince* and *Black Princess*, shall alone be charged with the plans of campaign for the cruise, of the disposition of prizes and ransoms, of sales and all other matters pertaining thereto. It shall be permitted to him to take whatever measures he likes in the discharge of these duties, without being obliged in any way to consult the undersigned interested parties. He shall not recognize as interested parties others than those who have signed the present contract. He may send prizes from the ports where they may have been brought to any other port either of this kingdom, or of Spain, or of any other neutral power which he may judge proper and advantageous to the armament. He may also insure, if he thinks it necessary, the armament either for its entire value or for a part thereof against all risks. Finally he may take whatever measures he chooses in regard to this armament without being compelled to seek any other authorization than that which is hereby given him by the undersigned interested parties.

These two cutters, such as they are, after being armed and made ready to be put upon the sea, together with the sum necessary to equip them with crews, cannon, provisions for three months, according to the inventory of each which will have been attached to the present regulation at the time of sailing, will be valued at 150,000 livres tournois, all commissions and expenditures whatsoever included.

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[a] Arch. Mar. Dunk., B 2, reg. 9. Letters from Sartine to D'Anglemont, 14 October, 16 Nov., 1779.

The undersigned by these presents declare themselves satisfied with this ppreciation of the total value of the armament of the two cutters and omise to pay at time of the signature of this document the sum subribed of the 150,000 livres by each. The *armateur* will thus be compelled furnish no account of the armament, and the undersigned declare themlves contented with the inventories of the state of the two cutters at the oment of their departure.

Shares will be issued for sums of one, two, three thousand livres and ore. No share shall be for less than 1,000 livres tournois.

Each of the undersigned will contribute proportionately to the expenses curred by repairs and disarmament. It will be permitted to Sir Jean orris to make a second armament after the first cruise is finished, if cirmstances are propitious, and to utilize for this purpose the proceeds of e first cruise and even, in case that such proceeds prove insufficient, he ay demand of each share-holder a sum in proportion to the amount of his ock. He shall be forced to justify such a demand by rendering an acunt which will prove its necessity.

The undersigned furthermore agree to allow to Sir Jean Torris in comnsation for the toil and labor required in the general direction of this fair, which is of a peculiar nature, a commission of 3 per cent on the total nount of the proceeds from prizes, ransoms and other sources whatsoever, hether the negotiations be made at Dunkerque or in other ports where orrespondents may be allowed other commissions or where extraornary expenditures may be necessary. Likewise a commission of per cent is accorded to the said *armateur* on the amounts of all exnditures and costs of repairs made during the entire cruise.

The undersigned hereby declare that, in accordance with the terms this contract for an armament of special character, they renounce the nefits guaranteed by all ordinances and regulations of the marine hich are contrary to the said contract, and they guarantee to the said Sir an Torris the enjoyment of all the benefits herein provided.

The *armateur* promises and hereby pledges himself to liquidate and vide among the undersigned the proceeds, as soon as the prizes shall ave been sold and all returns made, after the cruise is terminated.

The undersigned agree to follow in respect to this armament the regution, laws, etc., of the Congress of the United States of America govning privateering, and to accord to the crews the half of all proceeds from rizes, ransoms and other profits resulting from the cruise, after deduction as been made for the aforesaid cost of armament and in conformity to the ay which was followed for the first cruise of the *Black Prince*.

Made in good faith at Dunkerque, the sixth day of October, 1779. greed for 1 1/16 interest, Pat. Dowling (signed); for 1/12 interest, J. orris (signed); for 1/12 interest, Edward Wildallies Macatter (signed); r 1/12 interest, Luke Ryan (signed); for 18,000 livres, Vandenbrucke igned); for 5,000 livres more, Vandenbrucke (signed); for 1,000 livres d interests, J. Torris (signed); for 1,000 livres for the account of M. receveur, J. Torris (signed); Id. for the account of M. Hanmque, J. orris (signed); Id. for different women, J. Torris (signed); 1,000 livres

master of the situation, which was the surest means of carving for himself at the proper moment the lion's share.

The minister did not await the outbreak of complaints from the crews and other individuals, which were provoked in the month of August by the conduct of Torris, before being alarmed by the tenor of such contracts. The danger was signaled by the general secretary of the minister of the marine, who was frequently sent on a voyage of inspection in the ports of the kingdom and who was particularly competent in matters concerning privateering. His name was Sir Chardon. The minister wrote on 30th May, 1780, to the Admiralty of Dunkerque in the following terms:

M. Chardon has informed me, Sirs, of a contract of armament which Sir Torris has presented for the *Sans Peur*. The terms in which this contract is conceived are so contrary to regulations that I am amazed that you have permitted its registration. That clause alone by which the interested parties declare that they renounce the benefits guaranteed by all ordinances, contrary to the terms of the said contract, is so contrary to the maintenance of good order that it should have aroused the vigilance of the administration and should have engaged the procurator of the king, whose function it is to supervise the enforcement of the laws concerning privateers, to demand the suppression of this contract; and a decision should have been rendered in conformity to his demand. The will of His Majesty is that this contract be suppressed, and that you take the steps necessary to have its terms changed in conformity to the law. You should see to it that in the future no contract be registered which is not in conformity to the law, to the regulations and the maintenance of good order. (Signed) de Sartine.[40]

The judges of the Admiralty at first rendered a provisional decision condemning the articles of the contract which were contrary to the royal declaration governing privateering, and then prepared to render a second and final decision in obedience to the minister, who, on July 5, formally commanded them again "to see to it that in the future no contract be made of such irregular character as that of Sir Torris."[41]

In the meanwhile the *Black Prince* and the *Black Princess* were capturing prizes. Wishing to profit from the terms of his contract, Torris sought to escape from the jurisdiction of the Admiralty, to which he of course was subject, by submitting his prizes to the judgment of foreign courts and thus renouncing the authority of his own sovereign.

[40] Arch. Greffe, Reg. arr., règl., ord., f. 21.
[41] *Ibid.*, f. 33.

"The armaments which Sir Torris has made for Congress," de Sartine wrote on August 11, "and the letters of marque which he has attained from it, do not free him from being subject to the jurisdiction of the Admiralty. If his pretensions were allowed, it would mean the overthrow of all order, and it would be impossible for His Majesty to tolerate it without compromising the inherent rights of his sovereignty. Consequently his will is that the liquidation and final settlement be made before you for all prizes which may have been made by the privateers which he has equipped for Congress." De Sartine commanded the judges to protect the interests of the crews and investors and closed his letter as follows: "You shall see to the execution of the orders of His Majesty in regard to this matter. Besides, inasmuch as the letters of marque issued by Congress in favor of Sir Torris should have been withdrawn, as all others of this nature which have been accorded to subjects of the king, I hereby notify him that he can no longer have his vessels sail under any other flag than that of France." These orders were supplemented on August 10, 1780, by the following letter from the king to the Admiral of France:

My Cousin, I am informed that certain contentions have arisen in regard to the judgment of prizes made by privateers which have been equipped by the authority of the United States of America in the ports of France, and which the commissioners of the *conseil des prises* have considered themselves incompetent to judge. In order to allay all uncertainty in regard to the matter, I am writing you this letter to say that my will is that the prizes captured by privateers armed by the authority of the United States within this realm and conducted into any of my ports, be judged by the aforesaid *conseil des prises* under the same form as that employed for the judgment of privateers armed by my subjects, and that consequently the officers of the Admiralty observe in regard to them the formalities prescribed by my declaration of June 24, 1778. In order to insure the complete execution of my wishes in this respect, you shall make this known in all the ports, so that the captains of these vessels be informed of it and conduct themselves accordingly, as also the officers of the Admiralty. I pray God, my cousin, that he hold you under His holy and sacred protection. Written at Versailles, 10 August, 1784. (Signed) Louis.

de Sartine.

Torris, nevertheless, so complicated matters that, in order to proceed to the liquidation of the prizes and not postpone it in-

Ibid., f. 40.

Ibid., f. 41.

definitely to the detriment of the interests of the crews, it was necessary to recognize the papers which he produced. They were, of course, not in conformity to the requirements of the ordinances, but this irregularity of procedure was excused on the grounds that the armament dated from a time when the king had not as yet made known his intentions concerning the formalities to be observed in regard to the prizes captured by American privateers armed in France. The Minister of the Marine, Marquis de Castries, ordered that one should not fail to collect from the proceeds of these prizes six deniers the livre for the profit of the Invalides de la Marine. Torris attempted to escape from the payment of this tax.[44] The bad faith of this *armateur* appeared again at the end of the war. Luke Ryan, a captain, was made prisoner. The English prepared to treat him as a rebel, and consequently to inflict capital punishment. Torris implored the French government to intervene. "Repeated efforts" were made in his behalf at the court of London and success was obtained "in saving the life of this brave sailor." But then Ryan was kept imprisoned for debts. He was still in prison in May, 1783, and Marquis de Castries wrote to d'Anglemont: "It is of importance that you make this *armateur* (Torris) procure at once the liberty of Luke Ryan, Esq., either by paying the debts which he owes or by giving bond for the same, except as to those debts against him which may be exaggerated, but the liquidation of which cannot be delayed without giving rise to just measures against Sir Torris." Captains were generally interested in the operations of their *armateurs*. By a strange coincidence, from the moment that these captains had the misfortune to be captured, the amount of their debts increased enormously during their imprisonment.

The following year Torris had not yet paid the amounts due the crews from the sale of prizes. The minister ordered his prosecution, and the seals were placed upon the house of the *armateur*. Although the cruises of his vessels had proved profitable, his situation became more and more complicated. On June 24, 1785, he demanded from his creditors a large enough allowance for his sustenance. On July 21, his debts were liquidated, but this formality did not close up affairs, because in 1788 we find him still in a state of bankruptcy.[45] Other *armateurs* endured

[44] Arch. Greffe, Reg. arr., règl., ord. f. 72; 26 November, 1780.
[45] Arch. Mar. Dunk., B 2, reg. 13, 14, 15, 19.

the same fate at the end of the war, and they were not those whom the fortunes of the war favored the least. Their lack of square dealing necessitated court procedures, and officers of justice absorbed a large part of the profits. Thus, Moultson and Drew captured the *Apollo*. A dispute arose with their *armateurs* as to the division of profits. The court procedures cost 29,500 livres.

* * *

The composition of the crews of the vessels commanded by American privateersmen is very similar to that of those commanded by the French. It offers the same strange mixture of men of all nations. Thus, out of 191 men aboard the *Black Princess* in August, 1781, 60 were foreigners of different nations, licentious soldiers and volunteers from every source. When this vessel sailed from the road of Morlaix, the coasting-pilot who conducted it counted 230 individuals instead of 191. The additional 39 kept themselves in hiding up to the moment that the vessel reached the open sea. They were evidently deserters from Brest or neighboring regiments.

These crews proved themselves not inferior to the others. When, on August 8, 1782, at 10 o'clock in the morning, one Robert Jackson, aboard *La Fantaisie,* Captain Richard Boom, "jumped into the sea because he was possessed of a devil," it was evidently an exception,[46] and when on May 24, 1780, at the capture of the brigantine the *Paquebot de Bridlington,* Captain Hutchinson, by William Fall, in command of *L'Union Américaine,* "the said Captain Hutchinson was killed by a sailor aboard his vessel with a pistol which 'went off' at his side," it was evidently an accident.[47]

Mutineers were rare. We have found only two cases indicated. In January, 1781, Fall, commanding the *Sans Peur,* was in the road of Dunkerque. His crew mutinied and, wishing to blow up the vessel, threatened to deliver it into the hands of the English. The captain fired a cannon to summon a boat of the port to his aid, which failed to respond. Fall succeeded, nevertheless, in overpowering the mutineers and placing them in irons. He went ashore to file his complaint with the commissioner of the marine, Quenel, who arrested the prisoners and imprisoned them in the

[46] Arch. Greffe, Rap. guerre, f. 31 v°.
[47] *Ibid.*, f. 68 v°.

jail of the Admiralty. The number of the mutineers is not indicated, but it could not have been large because Fall was able to equip his vessel immediately afterwards.[88] The other case of insubordination was that of the cutter *Phenix*, mounting twelve 4-pounders, and carrying a crew of 53 men. Having sailed from Dunkerque on November 11, 1781, it had captured one prize and accepted four ransoms when, in the act of taking possession of another captured vessel, the sixth in number, nine or ten of the crew disappeared in the hold of the vessel. The captain, George Ryend, sent one of his officers, Edmund Allen, to demand an explanation. They replied that they refused to perform the watch and one of them, shaking his fist, declared that "if an attempt was made to punish any one of them, one would have to settle with all." Ryend was compelled under these conditions to be content with the ransom of his last prize instead of sending it to be sold in France. The fires of mutiny were smoldering. A plot was formed to direct the vessel into some port of England and, at another time to blow up the ship. Having learned of the plot, Ryend and his état-major formed the resolution to place their prisoners and hostages in irons in order to be more secure, and then returned to Dunkerque, where they debarked the three leading mutineers. One of the hostages profited from the occasion to make his escape. The cruise was thus interrupted in full success and everyone suffered loss as a consequence.[89]

On the whole, the Americans conducted privateering like the French. Conditions were about the same, as were the tactics employed. Privateersmen employed a code of signals to communicate with one another. They carried a full set of flags of the different nations to serve in emergencies. Thus they flew the flag of the United States,[90] which the king formally forbade. Maccatter, who violated this regulation with ostentation even on sailing out of the harbor of Morlaix and passing near the Château du Tauvean, was signaled to the Admiralty officers as a person to be arrested in case of a repetition of this act. He again came under the ban of the law in persisting to give uniforms to his volunteers, which was formally forbidden.[91]

[88] *Ibid.*, f. 150.
[89] *Ibid.*, f. 204 v°.
[90] *Ibid.*, f. 55.
[91] Arch. Mar. Dunk., B 2, reg. II.

With greater facility than the French, the Americans in case of danger protected themselves by the employment of the British flag. Thus Ripner passed without trouble a British fleet under the escort of a double-bridged vessel, two frigates and two cutters. Codner, on being chased by a cutter of the royal marine, dissimulated himself among the small boats off the coast of England.[53] Each one employed tricks after his own fashion. Richard Boorn, having captured a brigantine with a cargo of grain and cloth, the *Rodney* by name, found it equipped with one iron cannon, one switzel and four cannon made *of wood*.[63]

The letters given for ransom were the subject of many smart practices. It was necessary to hide them in case of capture in order that the enemy might not destroy them. Double and triple copies were made of them. On July 2, 1781, Codner, captured by a hostile frigate, was conducted with his crew onto the aft-deck, "where they were searched even to the skin; but fortunately the letters of ransom could not be found, for Captain Codner had confided them to the ship's cook, who was humpbacked and who alone of the crew remained on board of the captured vessel to prepare a meal, and who thus saved the letters, which were hidden beneath his hump." [64] Even when the letters of ransom were recognized as good and valuable, English merchants had an unfailing escape from paying them; namely, by leaving their hostages in prison indefinitely, so that at the end of some years the expenses of maintaining the prisoners exceeded the profits of the capture and the captors released them.[65]

The English were not kind to the Americans whom they captured at sea. They treated them as rebels. Even under Louis XIV they considered as a deserter a captain of Dunkerque who spoke their language admirably and whose name had the sound of an Anglo-Saxon one. He was confided to the care of three soldiers, who were ordered to prevent him from sleeping until he died from fatigue. The American captains were forced to conceal their identity. Kenny conducted all of his expeditions under the name of Jean Grumblé and his brevet of lieutenant of

[62] Arch. Greffe, Rapp. guerre, f. 104.
[63] *Ibid.*, f. 159.
[64] *Ibid.*, f. 188 v°.
[65] A hostage captured by Moultson and kept imprisoned cost the captors 9,389 liv., 19 s., 1 d.

the royal frigate was granted to him under this pseudonym.[34] Many of those who displayed the greatest courage, and consequently most exposed themselves to dangers, received from the king this same brevet "in order to deliver them so far as it was possible from the bad treatment which they had to fear from the enemy in case of capture." They were granted by exception such brevets even when they commanded vessels of less than thirty cannon. In case of capture the quality of being an officer of the king was a powerful safeguard and the French government had that much more authority to interfere in their behalf. When cases arose it did not fail to do so.

The Americans, however, did not show themselves too severe toward their prisoners. They took care of those who were sick. Even in opposition to the royal ordinances which demanded their maintenance to serve for exchanges, they surrendered them under the least pretext, either by entrusting them to neutral vessels met on the seas or by letting them loose upon the shores of England. Sometimes they enlisted them in their own crews. It is very readily understood that these recruits did not offer all the security desired. Thus Merchant, having forced about a dozen of his prisoners to take the oath of allegiance to the United States, could have been only a little surprised when he sent them ashore on the English coast for a supply of water and failed to see them return. We may note in passing that it was a common practice to take a supply of water on the English coast. They always paid the inhabitants for it, as likewise they always paid for the fish which they took from English fishermen.[35]

Much better, one notes that kindly feelings toward men of the same race were stirred in their hearts. Ripner in the midst of rough weather, saw "a man in a red shirt" floating upon a raft. He made all possible efforts to save him and was prevented from doing so only by the state of the sea.[36] Christopher Codner, during a cruise upon *L'Union Américaine*, "saw the wreckage of a vessel upon the water, and in order to be ready to render services to humanity in case someone was found clinging to the wreck, he lowered his skiff and toward six o'clock in the morning he

[34] Arch. Mar. Dunk., B 2, reg. II.
[35] Arch. Greffe, *passim*.
[36] Arch. Greffe, Rapp. guerre, f. 104.

rescued a barrel of porter containing about 40 " fols." which was tapped and drunk by the crew." [illegible]

III

In conducting their cruises, many of the privateersmen thought of growing rich above everything else. There was a certain number of them, nevertheless, whose spirits were fired by an ardent patriotism and who gave proof of the greatest courage, sometimes of an incredible audacity.

When, on July 2, 1781, Christopher Codner was obliged to surrender, he did so only after having sustained a valiant struggle aboard his lugger, *L'Union Américaine*, against a frigate, the *Iphigénie*, Captain Hope, and a sloop of war, both of which cannonaded him within pistol shot. After several 12-pounders had made holes through his ship, the enemy boarded his vessel and were obliged to strike his colors with their own hands.[illegible] John Chitty, in command of the *Resolution*, gave chase to a brig, armed with six 6-pounders, which had fired a volley at him. He abandoned the chase a moment to effect the capture of a sloop at close quarters and then returned to the chase. After an hour and a half of combat, the brig lowered her pennant. Chitty came alongside to take possession. At his arrival, the brig broke her pennant aloft and let go her row of cannon, "empoisoned with mitraille." Chitty had one killed, four wounded and his vessel hit five times at the water-line. He was compelled to let the enemy escape (July 9, 1781).[illegible]

Bennett Negus sailed from Dunkerque on April 13, 1781, aboard the *Franklin*, a ketch of 280 tons, mounting twenty 8-pound cannon and carrying 157 men, and equipped by Sir Salomez. On the morrow, off Boulogne, he was chased by two royal English cutters. Without hesitating he came about and engaged battle, which lasted an hour. At the end of that time the enemy gave up the fight, after having twice refused battle at close quarters. On the 18th, he gave chase to several vessels to the entrance of the roads of St. Helens, and during two hours and a half he maintained a fight against three 14- and 16-gun cutters, which sought refuge near the shore under the protection

[illegible] *Ibid.*, f. 166

[illegible] *Ibid.*, f. 188 v°.

[illegible] *Ibid.*, f. 198 v°.

of the fort, whose fire forced Negus to regain the open sea. He had one killed and one wounded. On the 20th, he threw a brigantine upon the coast and captured a privateer armed with ten cannon. On the 22d, he chased another vessel of 16 guns to within three lieues of Falmouth, then a three-master. The enemy sent a lugger, armed with ten 4-pound guns, with orders to guard him during the night. He calmly cast anchor at one lieue from Falmouth-point to await the vessels which would sail at high tide. At six o'clock in the morning he perceived the lugger which guarded him. It was joined shortly by another lugger of 16 guns and a large cutter armed with twenty-six 9- and 12-pound cannon. All three gave chase and overtook him at six o'clock in the afternoon at ten lieues from Ouessant. After two hours of cannonading Negus attempted to come to the cutter at close quarters. Blood flowed in torrents. The bowsprit of the enemy became engaged in the rigging of the *Franklin*, whose crew, having already well shown their courage, became furious and, striking right and left with axes and sabres, destroyed the part within their reach. The two luggers in the meanwhile continued to cannonade. The cutter profited from the night-fall to quit the combat at close quarters and " fought no more except in retreating." Negus had six killed and 16 wounded and was compelled to go to Brest for repairs on the 24th. He resailed from that port on May 3, was cruising on the 5th near the Scilly Isles, where he captured the *Lady Graft*, en route from St. Eustache to London with a cargo of tobacco, sugar, coffee and indigo, and later he captured the *Diana*, armed with fourteen 12-pound guns and probably with a cargo. These two ships were a part of the fleet aboard which Admiral Rodney sent the fruits of his pillage of St. Eustache and which La Motte-Picquet had recently dispersed and put to route. Negus conducted the two prizes to safety at Lorient, where he equipped his vessel anew. Six days later he received 1000 guineas for the ransom of a brigantine which he captured on its way from Waterford to Cork, and he sank a sloop whose crew escaped to the shore. On the morrow (the 25th) he gave chase to a flute which had letters of marque and was equipped with twenty-two guns of 12- to 18-pounds. During the course of the cannonading his vessel was struck near the water-line, which caused such a bad leak that he was forced to retire, having two killed and six wounded. On the 26th and

27th he received ransom for five vessels and burnt a sixth. He touched at Cherbourg, then regained Dunkerque on June 3. This brilliant cruise yielded 1,065,947 liv. 16s. 11d.[62]

In addition to the profits which came from their shares in prizes, the families of the killed and wounded received at the end of active cruises supplementary indemnities. Thus, after a bloody battle fought on July 17, 1781, by Moultson, commanding *La Victoire*, this captain, who was seriously wounded in the right thigh, received as a recompense twelve shares, and the second in command ten shares. At the end of the cruise of *La Princesse Noire de Boulogne*, which under the command of Maccatter yielded 1,048,627 liv. 15s. 9d. (10th March-9th October, 1781), the following list of gratifications in favor of the killed and wounded was made: a lieutenant, killed, 300 livres; a director of prize vessels, killed, 200 livres; a wounded, 2000 livres; idem, 500 livres; idem, 300 livres; idem, 500 livres; idem, 200 livres; one burned, 200 livres.[63] Such casualities were a part of the profession. One must add that the corsairs did not always meet with stubborn resistance. Thus Luke Ryan, commanding the frigate *Le Calonne*, sent his lieutenant, Ménage, to capture a ketch. Ménage boarded her and "found the crew changing their shirts and packing up their belongings." The first person whom he encountered was the captain, who congratulated him on his capture and exclaimed in English "Fortune of war, I am captured!"[64] Adversaries of such happy dispositions were, to be sure, too rare, but between such and stubborn resistance there were varying degrees. William Fall, commanding *La Marquise de Castries*, set sail on December 12, 1782, from Morlaix, where he had been for repairs, and on the morrow gave chase near Start-point to a brigantine which, flying only a red "fly-pennant" at the main-mast, without any ensign, was making at full sail for the

[62] *Ibid.*, f. 163.

[63] The proceeds of this cruise yielded, in liquidation for the half belonging to the crew, 325,893 liv. 5 s. 10 d., "from which sum deduction should be made for expenditures for wagons, horses, boats, inquiries, imprisonments, furniture and effects broken and destroyed in inns, entertainment, liquor and other extraordinary and excessive expenses made and caused by the said crew, 60,121 liv. 4 s." The 24 shares of the captain produced 6281 liv. 4 s. 3 d., which, after deductions were made for advances made, yielded him 660 liv. 11 s.—Arch. Greffe.

[64] Arch. Greffe, Rapp. guerre, f. 146 v°.

coasts of England. Having overtaken her, Fall commanded surrender. The captain of the brigantine, Brown by name, refused with many round oaths in English. But under the threat of being fired upon, Brown tried to come about in such a way as to break the bowsprit of his opponent by entangling it between the masts and rigging of his own vessel. He did not succeed, but in the collision the boom of the fore-sail, four futtocks, the two fore-davits, the jib-stay of *La Marquise de Castries* were broken and a few planks split near the railing. Some of Fall's crew seized hold of the rigging of the brigantine in order to disengage their bowsprit. Captain Brown came about again, paying no attention to the sailors of *La Marquise de Castries* who clung aloft in his rigging. Unfortunately for him the latter outnumbered his own crew, and they took possession of his ship. Fall then came alongside and boarded his prize, which was named *Les Trois Sœurs* and was en route from St. Domingo to Altona with a cargo of colonial products. Brown still continued to defend himself by pretending that he was a Dane. After being conducted to Dunkerque he filed complaint before the Admiralty that his adversaries had insulted his flag by tearing it into strips and making belts out of it.

No attempt can be made here to give an account of all the combats of which the stories have been preserved in the records of the war. We cannot, however, pass in silence the cruise of the *Sans Peur* conducted under the command of William Fall from May 12 to July 16, 1781, which is admirable for the story of valor which it contains. Fall made three cruises aboard this vessel, which was a cutter of 120 tons equipped by Porean and Co. with 19 guns, 12 swivels and 85 men. These cruises yielded together 424,015 liv. 0 s. 7 d. We shall here recount the story of the second.[80]

Fall sailed on this cruise May 12. The same day he stopped a packet, from which he demanded 6 guineas. The 16th he gave chase to a brigantine which seemed to be a privateer armed with eighteen 9-pound guns and which, after a short engagement, took refuge under the fort of Bamburgh, whose cannon forced the *Sans Peur* to retire. On the 18th, he stopped a sloop which had already been captured and released on ransom of 350 guineas by Cottin, captain of *Le Boulogne*. On the 20th he captured two

[80] Arch. Greffe, doss. liquid., and Rapp. guerre, f. 170 v°.

brigantines, which were sent to Holland. On the 21st he chased another to the entry of the port of Dunbar. He cannonaded it with such persistence that his shot fell in the heart of the city. He retired after having supported the fire of a cutter which was anchored in the harbor. On the 22d, at the Isle of May, he forced the inhabitants to bring him a supply of water and debarked there 14 prisoners, who signed a paper certifying to their release. On the 23d he captured two sloops and arrived within cannon shot of the city of Arbroath. He sent some of the crew of one of the sloops ashore to deliver a message to the commander of the city which demanded ransom money under penalty of being bombarded. The commander inquired how much ransom was demanded. Fall in turn sent representatives to make known his conditions. The reply of the commander seemed ambiguous, whereupon Fall sent a second message. After waiting in vain for a reply for one hour and a half, he brought his vessel within pistol shot of the city, upon which he opened fire and continued until half-past ten o'clock. On the appearance of his representatives he ceased fire, but on learning of a refusal to pay the ransom he reopened fire, which continued until half-past eleven. He captured a sloop which was anchored near by. On the 24th, after having received ransom for the two sloops, Fall regained with a freshening wind the open sea. He captured and released on ransom another sloop on the 25th, and then pursued a cutter which took refuge under the forts of New Aberdeen, where another vessel seemed to be anchored. These two vessels were both privateers, equipped with 16 and eight guns, which, together with the land batteries, opened fire upon the *San Peur*. Fall replied with vigor and captured in succession the two privateers, after fights at close range. On the 26th he stripped one of them of all things of value and then set fire to it; the other he baptised *La Liberté* and placed her under the command of his lieutenant, Magery. On the 29th he captured the *Flying Fire*, a lugger armed with four 6-pound guns and two swivels, and carrying a crew of 30 men. He placed one of his men, Vasseur, in command of her, with orders to keep close to him. It was thus that Fall found himself in command of a small fleet.

On June 3 he lost sight of Vasseur and the *Flying Fire*. On the same day he captured the packet from Harwich to Hellevoetsluis, which was equipped with 12 cannon. After having anchored

in the road of Flushing, the *Sans Peur* and *La Liberté* continued their route to Middleburg. As the Dutch had removed the buoys, Fall ran aground, and before he had time to warn Magery, the latter did the same thing. At high tide the *Sans Peur* was refloated. *La Liberté*, however, although her guns were taken from her board, could not be refloated. People came from the shore in small boats and forbade him to continue his work of rescue He was forced to abandon it. He set sail on July 1 and, forced by strong winds, he anchored in the harbor of Middleburg. He hoisted sail again on the 3d, fought with two cutters on the 6th and was forced on the 7th by an armed frigate to give up the chase of a brigantine. On the 11th he was off Aberdeen and obtained ransom for three sloops. He was chased by a frigate, the wind was strong and his main-mast cracked in an alarming fashion. Nightfall came, he cast overboard a large barrel with a fire-signal, in order to deceive the enemy as to his direction, and then changed his course. At daylight he perceived that the frigate had disappeared. On the 14th, Fall encountered a fleet of 19 vessels coming from the Baltic, ten of which were three-masters, equipped with ten to 14 guns. The fire opened upon him left him in such a state that he was unable to undertake further captures. He sailed for Dunkerque, where he arrived happily on July 16.

It is very easy to understand that after such exploits William Fall was named lieutenant of the king's frigate on April 7, 1782, and began service with this rank on June 30.[*]

In addition to such cruises of long duration, Fall did not hesitate to attempt sudden adventures. As, for instance, one day [March or May 13, 1782], when on the quay at Dunkerque he was looking out at sea, he noticed anchored down the harbor at a distance of three-quarters of a lieue a sloop and a brigantine, both English. The idea at once came to him to capture them. He communicated it to four sailors near by, who approved it. He made an agreement with Sir Corbeau, an employee of his *armateurs*, Porean and Co., and secured his letters of marque and his brevet of lieutenant of the king's frigate. He borrowed a boat "from one of his acquaintances," and boarded *L'Entreprise*, a privateer under the command of another American, Thomas Fairley, who lent him some muskets and sabres. He and his men

* Arch. Mar. Dunk., B 2, reg. 11.

left their capes and greatcoats and then continued their way down the harbor.

John Chitty had formed the same idea about the same time. After a bit of difficulty, he obtained from the aforesaid Fairley the great boat of *L'Entreprise*, which he baptised *Good Luck* and which he equipped under the direction of Degravier and Watel, who at that time were arming for him *L'Actif* as a privateer. Aboard his boat he embarked Magery and six other compatriots who were hastily enlisted, borrowed again from *L'Entreprise* four swivels and a demijohn of gin, and then in his turn went down the harbor.

Fall and Chitty seized without striking a blow the two vessels, the *Ashburton* and the *Diligence*, the sale of which yielded respectively 72,339 liv. 17 s. 1 d. and 27,855 liv. 5 s., or a total of 100,195 liv. 3 s. 1 d. A deduction was made from this amount of 5227 liv. 3 s. for judicial procedures which were necessitated in order to have a settlement between the two captains, who had acted in harmony to effect the capture but were in disagreement over the division of profits. Fairley filed claim for damages to his large boat, which had its rudder and an oar broken.[67]

Thomas Abbott and Richard Ryend took part in the expedition under the orders of Chitty, and with the same captain they sailed shortly afterwards on a cruise aboard the *Renard*, one as pilot, and the other as second mate. At their return they bought from Sir Guilleman, one of the captains in the expedition where Royer lost his life, a cutter. They planned to arm her as a privateer at Calais and engaged Altazin, a sailor, to conduct her to that port. They were ready to make this short voyage when they learned that their cutter had disappeared from the port. Smugglers alone were capable of such an act. They hastened to Calais, but found no trace of their property. They took passage for England, where they learned that the thieves had grounded on a sand bank and the cutter had filled with water, and that those aboard had just enough time to gain the shore, where they destroyed her. Determined to make good their loss, Abbott and Ryend went to the bay of Westable, and seized the first boat which they could lay their hands upon in order to reach a sloop which was riding at anchor. They boarded her, opened the hatchway

[67] Arch. Greffe, Rapp. guerre, f. 229, 230, 232 and doss. liquid.

and found no one aboard. Cutting the cable they hoisted sail and arrived without accident at Dunkerque. They implored the favor of the judges of the Admiralty, explaining that they had only wished to take their revenge, and demanded the confiscation of the sloop as good prize to reimburse them for their loss. A decision was rendered in their favor (February, 1782).[76]

Such adventures are relatively frequent. On October 12, 1782, Davenport, an officer of the marine, demanded a large skiff, *L'Arlequin* by name, to attempt with five of his compatriots an adventure at the arrival of an English fleet in the roads of The Downs.[77] Success did not always crown such efforts, however. Thus, in the month of May of that same year, Thomas Roberts armed as a filibuster at Calais the *Trial*, a smuggler, manned by a crew of 12 English and Americans. Having sailed from the port on the 2d, they were chased during the night of the 3d by a sloop and were compelled to seek refuge at the coast of Dover. Seven of the crew deserted, although they ran no risk of capture, because the inhabitants mistook them for smugglers. Roberts did not dare return to his vessel. Together with three sailors he fled by the woods and across country to the bay of Westable, where he arrived on the 6th. Thence aboard a ketch he reached Gravelines. "They cowardly abandoned a vessel which no one thought of seizing" remark the records of procedure in speaking of the seven deserters.[78]

The seizures of small boats by prisoners to effect their escape are frequent enough. Neither Jean Bart nor Souville has a monopoly in the matter. The story of two men of the crew of John Chitty may serve as an illustration. Captured on April 20, 1782, by *L'Actif*, a cutter, William Robertson and Joseph Green were at first kept in irons during 11 weeks aboard the *Dromedary*, which served as a prison-ship for The Downs. Thence they were transferred aboard the *Panton* (?), a vessel equipped with 64 cannon. They were later placed aboard a prize captured by this vessel to be conducted to Plymouth. Two days after their arrival they spied a rowboat belonging to a man-of-war anchored close alongside. They embarked in it on July 26 with a small quantity of wine which they had smuggled from the prize, and then gained

[76] Arch. Greffe, Rapp. guerre, f. 223 v°.
[77] Arch. Mar. Dunk., B 2, reg. 12.
[78] Arch. Greffe.

tell the truth, they are but bagatelles, and they were not always recognized as true after an investigation had been made. A simple desire for personal vengeance sometimes furnished the motives for a sailor to make a false denunciation. One must not forget that the royal ordinances permitted and regulated plunder of provisions aboard prizes. In the heat of action errors were easily committed which were excusable in certain cases, and which, as a rule, were discovered and punished.

The most important case of pillage for the part of the war which occupies our attention, and in fact the only case which one can really call pillage, deserves to be told in detail. It lacks neither animation nor variety nor the picturesque, and gives one an insight into the curious traits of the life of privateers, which we have not found elsewhere so well described as in the records of the procedures and in the correspondence which this case occasioned.[78]

Jean-Etienne, Marquis de Ségur-Bouzely, about 50 years old, formerly lieutenant of the king, colonel of infantry in the marine service, was returing from Guadeloupe, where he had just resigned the command of Grande-Terre. His companions of voyage were Sir Jean-Luc Druault, lieutenant in the marine infantry, and a man of advanced age, Sir Augustin de Linières, an inhabitant of Gaudeloupe. Messrs. de Ségur, Druault and de Linières, instead of embarking on a French vessel where they would have run the risk of being stopped and made prisoners, preferred to take passage aboard a neutral vessel, thus hoping to escape the danger of capture. They bargained for their passage with the captain of one of the vessels of the Royal Company of Denmark, the *Emiliard*. The captain made them pay a high price for the security which his vessel offered to them.

Nevertheless, as they approached the waters of Europe, Marquis de Ségur did not conceal his satisfaction. He had noticed on the sea an English fleet of one hundred sail bound to England from Jamaica. By calculating its speed with that of the *Emiliard*, he estimated that he would land in a port of France 15 days

[78] Documents utilized for this episode: Arch. Communales de Dunkerque, 189, dossier de procédure, and 203, liasse; Arch. de la Marine à Dunkerque, B 2, reg. 12; Archives du greffe du tribunal de commerce de Dunkerque, Rapports de guerre 1779-1783; Dossiers de liquidations de prises (not classified); Registre des arrêts, édits, déclarations, etc., t. II.

before these vessels could reach the coasts of England. He would thus be able to announce the fact to Marquis de Castries, Minister of the Marine, who would have time to make preparations and capture the fleet. Marquis de Ségur would thereby render an important service to the nation and, thanks to the information furnished to the minister, "he would at the same time have an occasion to seek his favor for his own personal advancement."

An unfortunate event interrupted this dream of joy and destroyed his hopes. While the *Emiliard* was passing in sight of Cape Lizard, it crossed the pathway of a privateer of about 150 tons, which, on sighting it, hoisted the English ensign and fired a shot. The Dane could only respond to the summons by surrender. A boat lowered from the privateer came alongside and several men boarded her. He who was in command ordered the Danish captain to produce his papers, which were examined and found to be in rule. He demanded money, then the keys to the chests of the passengers, who were easily recognized to be Frenchmen of quality. One was thus forced to give money and the keys with which the chests were opened. The effects and papers contained therein were pillaged. "Marquis de Ségur was one of the victims who suffered the most from the pillage. Everything was taken from him, two chests filled with the finest linen, a fine costume, the complete livery of two lackeys and, besides, jewels, gold-braid and his seal with its case (in the margin here is written in the hand of M. de Ségur, 'many pairs of lace cuffs and many cases of liqueur'), all of which might be valued at 250 louis at least. Very fortunate was this gentleman to get off with the loss of his wardrobe, for, being recognized by one of the brigands as a man of quality, they treated him with the greatest injuries—threatening him with their fists—in order to make him reply to their bravados, which they would have seized as an excuse to cut his throat or to drown him, but this gentleman prudently supported all with patience—and conducted himself most wisely and politely by smiling."

From M. de Linières the corsairs took the hat which he wore and Portuguese money to the value of 12,600 livres; from M. Druault, his hat, buckles and other valuables to the sum of 50 louis. They seized also some preserves and "an American songbird." They embarked their booty aboard their boat and the *Emiliard* was left free to continue her way. Frightened by the

experience, the Danish captain refused to land his passengers in France according to the agreement made and took them to Copenhagen. Not until some six weeks after their arrival there, did Marquis de Ségur and the lieutenant, Druault, succeed in finding a way of regaining their native land, which cost each of them 4000 livres in expenses of travel and stops. As to the aged M. de Linières, incapable of sustaining the fatigue of such a voyage by land, he was left behind in Denmark, where he awaited a vessel to take him back to France.

There seemed to be small chance that the brigands would ever be found. Chance, however, is a great detective. M. de Linières, having succeeded in finding passage for France, was forced by reason of a leak in his vessel to land at Dunkerque. He had hardly set foot upon the quay of that port when a man stopped to look at him. After having regarded close enough to recognize him, this man accosted him by saying that he was among those who had pillaged him some three months before. He informed him that the privateer and its captain were in the port. He pointed them out to him and straightway disappeared. The fatigue of travel and suffering which he endured prevented M. de Linières to take at once the steps necessary to prosecute the affair. As soon as his health permitted him, however, he filed a complaint with the Commissioner of the Marine, M. d'Anglemont. This officer summoned the captain and one of the officers against whom the complaint had been filed. Their declarations gave no certainty as to the crime being committed by them. Neither the captain nor his crew was further disturbed. M. de Linières grew furious at this result and at the inactivity of the officers of the marine. He wrote to Messrs. de Ségur and Druault and all three together filed a complaint before the minister.

Chance again came to the rescue. In a café at Dunkerque M. de Linières encountered one Del Miquel, who had served aboard the privateer in question. "This young fellow who revolted against his escapades" declared himself prepared to make a true deposition of the facts. M. de Linières conducted him before the commissioner of enlistments. The same day a second member of the crew followed his example and five others did the same on the morrow. The affair began to create a stir. The first lieutenant, Cavaillé by name, who was the officer who had made a deposition at the same time as the captain, began to fear the consequences

of the adventure. He went of his own accord to the bureau of the marine, declared that his first deposition was false and made a new one. The *armateurs* of the privateer, Messrs. Peychiers and Torris, grew frightened in their turn. Counting on suppressing the affair, they made an offer to M. de Linières to make good his losses. The latter refused the offer in saying that "prosecution was necessary in the interest of the public welfare."

Del Miquel was obliged to leave Dunkerque in great haste. "By reason of the fact that he had disclosed the affair" he found himself "the victim of his probity and reduced to dire necessity, being forced to leave a place where his life was no longer secure." He sought refuge at Paris at the Hotel of Flanders, rue Froidmanteau. He there waited for M. de Ségur to obtain from the government a situation which would enable him to obtain some means of restoring himself from the losses which he had suffered. As to the "probity" of which he had given proof according to the claims of the plaintiffs, it is perhaps not so real as they thought. In reality, if Del Miquel and the others had denounced the "brigandages" of their officers, it is because they had attributed to themselves all the profit thereof and had failed to give a share to the sailors.

Who then was the guilty captain? His name was Nathaniel Fanning, born in the State of Connecticut and about 28 years old at this time. He had an uncle who was colonel in the English army and who was serving under General Cornwallis. Taken prisoner by the English, he remained 12 months in their hands, then made his escape and gained Dunkerque. He served in quality of second mate aboard the *Éclipse*, a privateer of 150 tons armed by Nicolas Peychiers and Charles Torris and commanded by one of his compatriots, Nicolas Anthon. Having sailed on November 30, 1781, to commence a cruise, Anthon directed his route toward the channel and captured five ships of the enemy, of which three were rescued by the English and a fourth the *Sandypo*[illegible], placed in command of Jacques Cavaillé, was struck by a projectile from an English fort and sunk, some 300 livres of merchandise being rescued from it. The fifth, with a cargo of woolens, was conducted to Cherbourg and sold for 40,393 liv. 11 s. 8 d. As the armament and equipment of the privateer had cost 210,406 livres there was a shortage of 177,328 livres 2 s. 6 d. Anthon returne[illegible]

to port on March 6, 1782. He was commanded to serve as second officer aboard the royal cutter *Pigmy* under the orders of Captain Missiessy. Instead of obeying, Anthon fled. Under the order of the minister of the marine, he was arrested at Brest on June 14 following.

In the absence of Anthon, Fanning received the command of the *Eclipse*. The *armateurs* spent 59,280 livres to put the vessel in condition to undertake a second cruise. He sailed on June 5, and returned on August 12, 1782, having taken four prizes, two of which were rescued by the English and a third was set at freedom by a decision of the Admiralty court. The fourth, the *Friends-Goodwill*, was sold for 62,070 liv. 0 s. 4 d. In addition he sank the *Beaufort*, a sloop without value. His report to the Admiralty failed to mention the neutral vessels which he had searched. On October 22 following, Fanning resailed aboard *Le Rongeur* with a small crew of 24 men and armed by Francois Victor Horeau. Two days later he captured a brig with a cargo of coal and a brigantine, the *June Rose*, which were sold for 21,439 liv. 14 s. 1 d. and 8282 liv. 1 s. 1 d. respectively. On the same day he was captured himself. Fanning made his escape and arrived at Dunkerque on the 26th. It was at this time that he was denounced by Del Miquel.

The Commissioner of the Marine, d'Anglemont, had not seen fit to arrest Fanning or the members of his crew. He attached no more importance to the affair nor did the judges of the Admiralty. M. de Linières appeared to them as a simple planter of Gaudeloupe. The ordinances authorized and even regulated the pillage of personal effects aboard vessels captured by privateers. In general an indemnity was paid by the captors to the captured.[76] It is true that in this case it was not a matter of an enemy captured, but of a neutral vessel on which a privateer had no claim. This fact should have received the attention of M. d'Anglemont, as also that of the royal procurator of the Admiralty, M. Coppens d'Hersin. Another fact of importance should have awakened their inactivity, namely, that one of the passengers robbed was named de Ségur and that the Minister of the Marine, Marquis

[76] A time came even when an indemnity for the coffer of the captured captain, otherwise called the "*captain's hat*," was paid him by his own *armateur* in the form of a certain percentage varying from 2½ to 5 per cent on the total proceeds of the cruise.

de Castries, was an intimate friend of his colleague the Minister of War, who was none other than Maréchal de Ségur.

Notified of the complaint filed, and displeased that he had not been informed previously of what had taken place, Marquis de Castries sent on November 5 a formal and sharp order to the commissioner of the marine to arrest Fanning and the crew of the *Éclipse*. On the 10th he addressed the following note to the judges of the Admiralty:

There has been brought to my attention, Sirs, the very serious complaint against the crew of the *Éclipse*, a privateer of Dunkerque armed by Sir Torris, for the pillage which they committed upon the personal effects of Marquis de Ségur and M. de Linières when they were passengers aboard the Danish vessel, *Emiliard*. I am surprised that you have not rendered me an account of a crime of such gravity, of which the procurator of the king could not, in fidelity to his duties, have failed to make complaint, and to have made an investigation of an affair which public rumor must have brought to his knowledge if he had no other means of learning of its existence. You shall inform yourself at once of the state of the affair and render me account of what you do to establish the crime and punish the guilty. I am, Sirs, your humble servant, Castries.

The prosecution of the affair took a more serious turn on the 24th of the same month, when the king, "considering that the criminal procedure which was being pursued at the Admiralty of Dunkerque might become so considerable, by reason of the number of the accused and of the accomplices, and that, if the regular order of justice were followed, the formalities to be observed would cause a prolongation of affairs which would enable the guilty and their accomplices to escape from the punishment which they deserve, and His Majesty also wishing to suppress such disorders by prompt and exemplary punishment, in order to insure public safety to his subjects and to give satisfaction to neutral powers for the insult made to their flag," revoked the procedure into his own hands and into those of the *conseil du roi*. He ordered the lieutenant-general of the Admiralty of Dunkerque to continue the prosecution. Coppens d'Hersin in turn expressed his surprise to learn of the affair by the letter of the minister. The procedure was in truth very complicated, by reason of the fact that it was necessary to pursue it not only at Paris and Dunkerque, but also at Morlaix, Vannes and Lorient. It was conducted thoroughly, thanks to the repeated efforts of the minister and of the general secretary of the marine. Finally the following

were incriminated: Nathaniel Fanning, Thomas Potter, his second in command, N. Morin, captain of prizes, Joseph-Marseille Marthe, sailor, Jacques Cavaillé, lieutenant, and Pierre Carbonnier, carpenter.

Stimulated in their activity by the turn that affairs had taken at Paris and by the pressing commands to conduct the affair "with attention, vigilance and celerity," the judges of the Admiralty acted in harmony with the commissioner of the marine. They began by sending to prison all the sailors of the *Eclipse* on whom they could lay hands. All of them who appeared to enlist for service on outgoing vessels were held in custody to furnish their testimony. These arrests of witnesses were, to be sure, only provisional, but three months later the unfortunate individuals were still groaning behind the bars, and inasmuch as they were forced to bear the expense of their sustenance during their detention in the prisons of the king, they found themselves within a short time without a cent and their families in the greatest distress. By contrast, the chief criminals, Morin, Malthe and, most of all, Thomas Potter, against whom the most serious charges were made, were sailing on waters far away, one knew not where. Sir Bandry, the royal bailiff of the Admiralty, assisted by Charles Oger, "trumpeteer and bourgeois," had proclaimed the three formal summons for them to appear, first before the doors of their lodgings, then before the guard of Place Royale, and a third time before the Council Chamber of the Admiralty. Loafers gathered around in great numbers at the summons, but none of the summoned responded. It was learned that Potter, after a sojourn at Vannes, embarked on October 23 on board the *Renette*, an American vessel. The legs of Bailiff Bandry were certainly not long enough to pursue his man.

It was thus necessary to continue the prosecution of the affair without Potter. Search was made at the store of a merchant of laces where Potter had had his lodgings, 10 rue de Bourgogne; also at the "Coq Hardy," the shop of Ch. Cailliez, where Morin had a lodging; but no other news was obtained than that Morin had, according to report, lost his life at sea; also at the hotel of Comte d'Estaing and at the Cheval Volant, rue St. Jean, of which an Englishman, Williamson, was proprietor. At both of these places Fanning had had lodgings.

On January 20, 1783, Marquis de Ségur communicated to the lieutenant-general of the Admiralty the following letter, which he had just received:

In the harbor of MORLAIX, Jan. 5, 1783.

Sir, In regard to the declaration which I made before M. de La Richeri, commissioner at Dunkerque, concerning the pillage which was committed by the privateer, *Éclipse*, Captain Fanning, I pray you, Sir, to permit me to add to the said declaration that Porter, after having brought a package of effects aboard, distributed them to all of us. I received from his hand a costume ornamented with silver braid, which I burned after my return from my imprisonment in England. If proof of this fact is necessary, I shall say that I burned it in my room, where Sir Harnes, a trader, asked me what I was doing and I told him that I was burning the costume which Porter had given me. Your humble servant, Cavaillé. P. S.—If I did not make this declaration before, it is because the captain advised me not to do so.

Another search was then made at the hotel Comte d'Estaing, *rue ancienne de Nieuport*. Two trunks belonging to Cavaillé were found. A list of their contents deserves mention. They contained a cloak of blue cloth with gold braid at the collar, a coat with red collar, a brown coat, a leather bag with six shirts, two vests of white piqué, one of cotton, ten pocket handkerchiefs, two of silk, one sheet, a towel, two pairs of drawers, an undershirt, a pair of white-plush breeches, another of black velvet mixed with cotton, a pair of silver garter-buckles, three cambric collars, a blue costume with sailor buttons *à fleur-de-lys*, a gold epaulette, a powder sack, four pairs of silk stockings, three of wool, two of cotton, a hat, a small dagger, a case with two razors, a soap case, a pair of slippers, a whip, spurs, a pocket-knife, four gloves, a black round fur hat, a towel, a costume of violet cloth, another of red cloth, two pistols, 36 livres in cash, a roll of marine charts, a pair of black satin breeches, a pair of spurs, a curling-iron, a compass, a syringe, two gold watches with chain and charms, eight white shirts, five soiled shirts, five pairs of silk stockings, one pair of knit stockings, two collars, one sword, a tobacco box, a flask, a comb.

Such a mixed collection could only arouse suspicion as to whence it came. Marquis de Ségur came to Dunkerque to examine it, and he recognized several objects as belonging to him. He found none, however, among the effects of Fanning. Fortunately for Cavaillé, it was learned that the trunk containing the stolen objects had not been left at his lodgings for his own personal count.

It proved very difficult to unravel the confused tangle in the testimony collected from the numerous depositions taken by order of the prosecution. Fanning confessed that he kept two sets of books: one, in english, the inaccuracy of which he recognized, and the other, in cypher, which contained the truth. As by chance, the latter had been lost in the sea. The truth as to what had taken place on board the *Éclipse* came slowly to light.

In spite of his efforts to maintain obedience aboard his vessel, Fanning did not always succeed in holding his crew in the subordination which they owed him. During the course of the cruise, his crew mutinied twice, threatening to depose him from his command, and under threats of violence forced him to return to port before the end of the cruise. He was compelled twice to order Potter, who directed the movement of the mutineers, to remain confined to his cabin. Not being in possession of a text of the royal ordinances on the marine, he was not sure of just what his rights consisted, and the French officials had failed to give him the necessary instruction. If he had flown the English ensign, it was in accordance with a general trick employed in war in order to discover English papers which might be concealed aboard vessels flying the flag of a neutral nation.

Potter had been generally charged with the mission of visiting such neutral vessels, and he did not always perform that mission with all the *finesse* desirable. Thus, aboard a Portuguese vessel he seized unjustly a double-barreled gun, a sword of Damascus, a spy-glass, an octant and several hats ornamented with plumes. Fanning had recommended to him in vain, as to most of the others of his crew, that he should not commit such acts of piracy. Potter continued them notwithstanding.

When Potter returned aboard from the *Emiliard*, he noticed that the pockets of one of the coats stolen contained letters addressed to the king and to the Count of Artois. He threw them into the sea. The sailors of the *Éclipse* murmured when they saw the booty which was brought back. To calm them, he gave them some wine and some of the liqueur which Marquis de Ségur had destined for His Majesty. When Cavaillé objected to such conduct, he threatened to blow out his brains. Potter then tried on one of the beautiful red costumes, which did not fit him. Fanning, who had been busy in his cabin up to that time in dressing a chart and who had "perhaps drunk a little too much," came upon the

be erased and blotted from the registers of the jail and a record of this decision be written in the margin thereof.

Carbonnier, the first carpenter, was assuredly not guilty, and it seems that the same is true of Cavaillé. The latter was a good subject. Formerly he served as an auxiliary officer aboard one of the vessels of the king under the command of Count d'Estaing and had taken part in all the campaigns, notably before St. Lucia, where he received a wound which forced him to resign from service. To gain a living he was forced to enlist aboard privateers.

On June 28, at the receipt of the text of the decision, Périer, secretary-general of the marine, wrote to the procurator of the Admiralty: "I do not believe that the condemned have enough effects to pay the expenses of the procedure. I pray you to let me know your opinion as to what may be done." This fact had been foreseen a long time before and, by the insistence of Marquis de Castries, the Admiral of France had consented to take upon his own shoulders the expenses of the prosecution. During the course of the prosecution, however, the *armateurs* failed to respond to summons made against them and were condemned for default. This was seized as a pretext to place all the burden of expenses upon their shoulders. In "expenses and restitutions" they were forced to pay 15,789 liv. 10 s. The net profit of the second cruise of the *Éclipse* was only 7759 liv. 4 s. 5 d. Thus there was another deficit to add to that of the first cruise, so that Messrs. Peychiers and Torris and investors in this armament suffered a disastrous operation.

Of all the moral lessons which resulted from the adventure it was perhaps this financial loss which most impressed them.

IV

What became of the Americans who had served as corsairs at Dunkerque, after peace was declared? Like other corsairs, most of them took service on merchant vessels, and many returned to America. Some of the captains whose records we have been able to trace in part had experiences of varying fortune.

Moses Bailey had commanded *La Charmante*, a frigate of 110 tons on a cruise which yielded 139,428 livres; later, having commanded in succession *L'Espérance* and *Le Poisson-Volant*, he retured to port empty-handed. He seemed to be a mediocre sailor. After the war he forsook the sea and maintained a drink-shop

public. This foreigner, being met at seven lieues from Havre by four pilots who offered to aid him by their escort, refused their aid and counseled them to board a vessel which was in sight and at a distance of about one *lieue*. They hastened to do so and did not realize until they were well within cannon shot that this vessel was an English cutter armed in war. The enemy forced them to come aboard, retained them during several hours, and did not set them free before damaging their vessel considerably. If the aforesaid Captain Georges Fernauld arrives in one of the ports of your jurisdiction, you shall order his arrest and have him brought before the court for trial."[79]

The list of discreditable cases ends with this. The records of the others open to us some pages of brilliant history.

First of all is Luke Ryan, who in 1781 obtained the enjoyment of rights of *bourgeois* at Dunkerque. In 1784 he reclaimed in vain 160,000 livres which were owed him by his *armateur*, Sir Torris. When he returned from imprisonment in England, he found Torris in bankruptcy and he thus lost the larger part of all that which he had gained during the war. In 1786 he was 35 years old, having spent 20 years upon the sea. A letter from the king to the Admiral under date of January 27, 1786, mentioned the fact that Ryan had captured 80 English vessels without counting those which he had sunk, that he had captured 60 cannon, made more than 500 prisoners, and had fought through 13 combats, in the course of which he had received many wounds, and had passed three years in the prisons of the enemy. The king ordered that he be set at liberty, and as an acknowledgment of his services he authorized him to be received as "captain of vessel" and placed in command of a vessel at Dunkerque."[80]

On July 31, 1788, William Ripner received the same favor, although he did not offer sufficient justification for it. The exceptional services which he had rendered, however, were taken into account.[81] On May 28, 1793, he took command again of a privateer and sailed aboard the *Sans Peur*, a vessel of 25 tons equipped by Degravier. In August, 1795, we find him cruising aboard *Le Petit-Diable*, equipped by Hayart. He was promoted to the rank of lieutenant and took many prizes. In March, 1800, he was considered as a possible commander for *La Désirée*, one of the four frigates of the division placed under the command of

[79] Arch. Mar. Dunk., BB 2.

[80] Arch. Ville Dunk., 203 (liasse).

[81] Arch. Mar. Dunk., Annexes à la correspondance ministérielle.

Castagnier. Ripner had already asked Plucket to serve as t[he] second, who had agreed to do so, when, at the last moment, t[he] command of this vessel was given to Captain Plancy. Plancy w[as] killed aboard her on the night of the 25th of June following.[82]

Among them all it was John Moultson whose fortune was t[he] most brilliant. In August, 1783, as *armateur* he failed to pla[ce] in accordance with regulations a surgeon aboard *La Sophie*, a[nd] was condemned to a month's imprisonment. The king annul[led] this sentence "because he (Moultson) had already suffered mis[-] fortunes." He occupied the rank at that time of lieutenant o[f] the king's frigate. On May 1, 1786, he was promoted to t[he] rank of sub-lieutenant of the king's vessel. On June 6, Merci[er,] *ordonnateur* of the marine, wrote to de Castries in regard to hi[m:] "He is a good sailor who gave during the course of the last w[ar] proofs of the greatest courage."[83] On October 1, 1787, he w[as] named officer of the port of Dunkerque. In July, 1790, we fi[nd] him interested for a one-third share in the armament of *L[a] Therèse*, armed by the widow P. S. Fiquois.[84] Castagnier, wh[o] was shortly to play an important part in the defense of Dunkerq[ue] against the English and who at that time was a sub-lieutenan[t] was also interested in this armament for one-third. The tensi[on] in the relations of France with the other European nations, a[nd] particularly with England, made one foresee that a war w[as] inevitable. De La Luzerne, the minister sought to gain t[he] greatest possible information of what was taking place in Engla[nd] by means of smugglers and of merchants who had correspond[-] ents there, but the information thus gained was not exact. I[n] order to have more precise news he ordered Mercier to pro[fit] from Moultson's knowledge of English by sending him t[o] England.[85]

Moultson must have acquitted himself of this mission to t[he] satisfaction of the government, for in December, 1792, we fi[nd] him with the rank of "*capitaine de vaisseau*" and in command o[f] a strong naval division composed of 625 men and stationed at t[he] mouth of the Schelde. He was under the orders of Dumouriez, who commanded him to winter at Antwerp. The sailors were

[82] *Mémoires de Plucket*, Dunkerque, 1843, in 8°, p. 313.
[83] Arch. Mar. Dunk., B 2, reg. 11.
[84] Arch. Ville Dunk., 192.
[85] Arch. Mar. Dunk., BB 2, reg. 20.

dly better equipped than the soldiers of the army, who wore *ots* (wooden shoes). Monge, the Minister of the Marine, inmed the *ordonnateur* Najac that the officers under Moultson ere in need of everything and did not have the wherewith to cure for themselves the most necessary articles."[89] Najac was lered to send them provisions. All the letters of Monge which ke mention of Moultson never fail to prefix to his name the rd "brave" and to praise his activity. The following adssed to Toustain, who had just succeeded Najac, and dated ril 10, 1793, should be noted:

have learned with much sorrow of the total loss to the Republic of the ned gun-boats and the transport vessel which remained ordinarily at ges or at Ostend, and I bemoan the fact that all the zeal and diligence the merchant officers and of the crews which you sent have come to ght by reason of the delay of General Pascal, which perhaps was inious. I am looking forward with much satisfaction to seeing the ve Moultson. In spite of the fact that all the successes which he had nned have failed to be realized by reason of the attempt which was de to carry out projects which were planned with as much perfidy secrecy, he deserves nevertheless the gratitude and esteem of the public.

In the year 1795, Moultson had the misfortune to be captured the English, and two years later we find him still in their nds. Too noble-hearted and too disinterested to grow rich from office, Moultson's resources had remained slender and were n exhausted. His wife was in direst need and sought relief m the government. After he had been set free, Moultson gan privateering again. Inasmuch as armaments were being de more rarely at Dunkerque, he went to Calais, where he took nmand, from March 4 to April 27, 1801, of the privateer *La ciété* a lugger of 80 tons with a complement of 36 men and ipped by Louis Barbe. He succeeded in capturing only three zes, two of which were recaptured by the enemy and the third ted only 34,216 francs 7 s.

Besides the names of American privateersmen which we have t with during the period of the American Revolution, we meet h those of others when hostilities break out in 1793. There for instance, Job Bunker, who came to Dunkerque in 1786 with group of Nantucket fishermen to develop whale-fishing. He s in command of *Le Postillon de Dumouriez* in 1793 and of

Ibid.

Le Sans Peur in 1805 and was taken prisoner before he succeeded in capturing a prize. Another American was Ferrey, who was in command of the *President Parker* in the years 1797-17 and captured prizes which yielded more than 300,000 livres. Another was Thomas Huston, commanding *Le Victorieux*; still another, Victor Sparrow-Swas, who commanded in succession *Le Riboteur* (1798-1799), *L'Imprenable* (1799-1800) and *Le Clairvoyant* (1800-1801), and who captured prizes to the value of almost 800,000 livres. The capture of one of these prizes gave rise to a very strange judicial procedure which throws some light on maritime commerce. On December 24, 1800, near Texel Sparrow-Swas captured a vessel with a cargo of wheat, *Veranderung* by name, which flew the Danish flag and was bound apparently for Lisbonne. Sparrow-Swas dissimulated his flag and took possession of the ship. When, however, Degravier-Verquere, his *armateur*, learned the news of the capture, he grew afraid that the dissimulation practiced by his captain would be discovered and that the vessel would be declared wrongly and unduly captured. In that case he would be compelled to pay a large indemnity to the injured parties. He hastened therefore to send an order that the prize be set at liberty, and he wrote also to that effect to the French commercial agent at Amsterdam. The proprietors, or the pretended proprietors, of the *Veranderung*, seeing another means of obtaining damages, did not file complaint before the French court of prizes, but did so at the Bureau of Convoys at Amsterdam, where they received authorization to seize three of the prizes recently conducted into port by *Le Clairvoyant* and named *Robert*, *Thomas and May*, and *Fame*. The seizures were made. Degravier pleaded the incompetence of the Dutch court but in vain. He learned that the pretended proprietors of the *Veranderung* were more concerned with appropriating to themselves the proceeds of the three prizes than with regaining possession of their own vessel, which with very small expense they could have sent upon her way. Degravier thereupon made an appeal to the *Conseildes Prises* at Paris, which declared its competence in the case and ordered the minister of foreign affairs to file protest with the Dutch government against the seizure of *Le Clairvoyant's* prizes. This action interrupted momentarily the pursuits of the claimants, but the vessels were guarded under seal and sequestered. The claimants established power of attorney to

safeguard their interests. Inasmuch as the *Veranderung* had not been declared good prize and confiscation had not been made of its cargo, which remained untouched aboard her, the damages could not have been very great. Degravier proposed a settlement for 7000 francs and a payment of 2000 in addition for lawyers' fees. He made a deposit of the sum. This was refused, however, by the claimants, who continued their vexatious procedures. They finally succeeded in carrying out the plan of renouncing their possession of the *Veranderung* and of her cargo in order to justify a larger claim for damages.

Degravier then turned against the attorney established by the claimants and after a vain attempt at settlement before the justice of the peace, entered suit against him. The attorney pleaded incompetence, but lost his appeal. In the meantime Degravier died. He had not ceased to fight against the claimants by the intermediary of the French commercial agent at Amsterdam, of Dutch ministers, of the King of Holland and of the Emperor himself, but all in vain. Of the proceeds from the three prizes, the heirs of Degravier were ordered to pay 40,719 florins 8, although the French agent entered protest. They refused to accept the rest which remained from the sale on the grounds that the procedure was unjust. Finally, in the year 1823, the affair of *Le Clairvoyant* was finally liquidated, but the proceeds from only one prize were credited to those interested in her armament. This prize was *Le Commerce*, sold at Bremen for 26,742 francs.

At the end of the Empire privateering became more and more a war carried on before the courts.

It remains for us to cite the name of Thomas Keasbery, who commanded two privateers, *Le Républicain* (1793) and *La Delle* (1798-9), and succeeded in a happy adventure. The tribunal of commerce, which after the suppression of the Admiralty courts in the new organization of the state had jurisdiction over privateering wrote on February 6, 1793, to the minister of the marine as follows:

Citizen, The captain of the privateer *Le Républicain*, furnished with letters of marque issued this morning, and impatient because his vessel was not yet prepared to sail, equipped a large boat with himself and eight other men who were armed each with guns. He then rowed down the harbor and brought back this evening the English cutter *Betsey*, manned by a crew of seven men.

, which forced our sailors to help man its vessels during the preceding

t the news of the outbreak of a war between England and nce, President Washington commanded the observance of a ct neutrality. The French government desired that the flag neutrals and especially that of Americans be conscientiously pected. A letter by Monge leaves no doubt on the point:

itizen, Being informed that certain Frenchmen have seized vessels nging to the United States of America, I hasten to urge you to take most prompt and most efficacious measures to suppress this brigandage, ch is very compromising for French honor and good faith. You t feel how important it is for the Republic to maintain the good feeling ch reigns between it and the United States and to draw tighter, if pos-, the lines of a fraternal alliance with a people who, having conquered wn liberty, appreciates our principles and respects our rights. In order sure the enforcement of measures which you will have taken in regard he matter, you will act in concert with all the properly constituted of-ls, who will undoubtedly be eager to lend their aid in the accomplish-t of an act which is so much in harmony with justice and the rights nan."

Iere, as in all former time (Vauban signals in his time the stence of the difficulty), privateersmen had much trouble in ermining the nationality of the ships which they captured. guet, Minister of the Marine in 1795-6, sent to the armed ces of the Republic and to privateersmen the information that re were four vessels of the island of Guernsey which were igating with false papers under the flag of the United States ug. 21, 1796). This practice was too widely extended for a ticular warning of this nature to prove efficacious. It was l known that the English had made out a number of counter- American passports for vessels (September 1, 1796), and on 16th of this same month Truguet was compelled to give the er to hold all American vessels coming from England, because ir captains aided the *émigrés* to re-enter in France."

The war of 1812 between the United States and Great Britain ught no privateersmen to Dunkerque. That port had at that e lost its ancient splendor. The suppression of its privileges l dealt it a fatal blow. Nothing longer attracted there eign sailors as did the exemption from compulsory enlistment

Ibid., 72.
Arch. Mar. Dunk., BB 2.
Ibid.

of by-gone days. The organization of the flotilla of Boulogne contributed no small part to the diminution of the great activity in the port. The *armateurs* of Dunkerque made their equipments very frequently elsewhere, as at Ostend, Flushing, Dantzig and even in Sweden and Norway.

Shortly afterwards, when Louis XVIII was restored to the throne of France, if the Americans had had the desire to arm privateers, the French government would have forbidden it. The commissioner of the marine received formal instructions under date of May 23, 1814, as follows:

Sir, The fact of the suspension of hostilities between France and England puts an end to the permissions to American privateersmen to enjoy all the advantages which were granted them in our ports during the time when we were at war with Great Britain as they are now.

Inasmuch as our relations with both powers should be in conformity to the rules of strict neutrality, His Majesty commands the following:

1. During the entire course of the war between Great Britain and the United States of America no vessel shall be armed in the ports of the realm for the account of either belligerent.

2. No French subject shall take an interest in any of their armaments.

You will please make known immediately these intentions of the king in all the ports of your jurisdiction and have the present letter enregistered at the bureau of inspection. (Signed) Malouet.

The second letter from Malouet read as follows:

Sir, In a letter of this date I notify you of the intentions of the king concerning the neutrality which is to be observed during the war between Great Britain and the United States of America.

His Majesty is not content to allow English and American armaments to be made in the ports of the realm and in prohibiting his subjects from having a share in the armaments of these nations.

In order to establish more clearly the obligations and duties of this neutrality, to prevent claims against the French by either one of the belligerents and to determine the time and the means of establishing the principles governing prizes which might have been or may be conducted into the ports of France by English or Americans, the following intentions of the king are hereby made known:

1. No vessel of the said powers shall sail from the ports of the realm before having given assurance that it will not attack vessels which have already been signaled or which are in sight or which will have sailed from the same port within the last twenty-four hours.

2. It will be permitted to armed vessels of the two belligerents to seek refuge, even with their prizes, in the ports of the realm, whenever accidents of the sea or care for their safety or other interests force them to seek such refuge.

3. The sale of prizes conducted in our ports by the belligerents is hereby temporarily defended.

These orders, Sir, may later and at a more suitable occasion be published, but for the moment it is sufficient that they serve merely as a guide of conduct for officers of the marine.

Thus you will be pleased to communicate a copy of the present dispatch to the administrators of the ports of your jurisdiction and command them not to publish it but to conform their conduct nevertheless to its provisions. Consequently, whenever an English or American ship of force makes ready to sail from the ports, the officer of the marine in a most civil manner, shall require the commander to give assurance not to attack a vessel of the enemy in a situation described above in the orders of the king. No officer can refuse to give such assurance, because the demand for it is based on the respected principles of neutrality and on the desire to observe them with the most scrupulous exactitude.

In every case arising an account shall be rendered me of what has been done.

Whenever English or American armed vessels take refuge in our ports or when they conduct their prizes thither, they should be admitted without any difficulty and I shall be informed exactly of the fact.

As to the suspension of the right to sell prizes belonging to the belligerents, the minister of foreign affairs has communicated the intentions of the king to the minister of finance.

The present letter shall be registered at the bureau of inspection. (Signed) Malouet.[91]

At this moment French public feeling, exhausted by the din of battles, courted peace. The fire of enthuiasm which had forced the hand of Louis XVI in 1778 had been extinguished by the torrents of blood which had been shed by the nation upon all the battle-fields of Europe throughout 25 successive years of formidable warfare. A general peace was concluded in 1815.

As a souvenir of the sojourn of the Americans at Dunkerque who were privateers from every State of the Union and whale-fishermen from Nantucket, one of the quays of the port guarded for a long time the name, *Quai des Américains.* The name has now disappeared.

The time has long since come when the two great Republics, by the erection of monuments in public squares, have hallowed the memories of their brotherhood-in-arms of by-gone days. It has seemed to us that the memory of the events which have been recounted above deserved to be rescued from the dust of archives. They form but an episode in the great march of the nations, but they contain their share of instruction. They reflect their ray of glory.[92]

[91] *Ibid.*

[92] Raymond de Bertrand, *Le Port et le Commerce Maritime de Dunkerque au xviii^e^ siècle*, Dunkerque, 1864, in 8°.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ꞏTORY OF ENGINEERING COMPETITIONS IN THE NAVY.

By Lieut.-Commander E. C. KALBFUS, U. S. Navy.

: is probable that two naval vessels never made a voyage in .pany without their coal consumption becoming a topic of versation and a basis for comparison. Except in cases :re the discrepancy was so great as to lead to an official :stigation, the comparison never amounted to much, after the n signals were hauled down. Sometimes excessive expendi- was attributed to inferior workmanship or poor design; etimes to poor coal, or to foul bottom. Rarely was it assigned nethods of operation. The machinery of our vessels was erally in good condition. Generally, leaks were looked after stopped, but not to the extent that is now the case. A vessel .me known as a "good steamer" or a "poor steamer" and, :pt in a few isolated cases, she remained what she was at first. ot so very long ago it was rare for a vessel to make her con- t speed after having been in commission for two or three 's. Runs at high speed were sometimes held; the measure esults was the relative position of the vessels at the finish. No icular pains were taken to definitely determine the state of neering efficiency on board a certain vessel by comparing a nt performance with one made in the past, or to cast about for ons for failure, except to lay it to "leaky condenser," "hot " etc. There did not exist a desire on the part of the personnel ıe average vessel to run at full power in order to demonstrate all the details required for a successful outcome had been fully attended to. And such a desire was not encouraged, for importance of engineering as affecting battle efficiency was :r not understood or was neglected.

It is suggested that all this important duty be taken up by the fleet engineer, and that this officer be relieved from duty as senior engineer officer of the flagship, in order that he may be entirely free to devote himself to the economical running of the machinery of the various vessels, and prepare the necessary instructions for issue to the ships of the fleet.*

It is thought that the methods that have proved so successful in the case of gunnery might be applied to engineering with equally good results. Establish competitive tests and trials, with trophies and prizes for the best ships. Such trials should include those for economical coal consumption, as well as for speed.

The question of economical coal consumption is an important one for it results not only from the proper firing of the boilers—a question of training of the firemen—but also from the maintenance of the machinery in proper condition.

It is believed that many matters such as the firing, gas analysis, coal analysis, proper number of boilers to use under different conditions, proper cut-off, tightness of main engine valves and pistons, temperature of discharge water, temperature of feed water, tightness of steam and exhaust joints, use of half-burned ashes, etc. are not being given the attention they should, and although a careful scrutiny of the steam logs might bring about the issuing of instructions along the line of economical management, it is thought that proper attention to this matter can best be given by the officers of the ships who are more closely in touch with it.

An attempt has been made on recent trials to use proper system of firing and also in some cases, to analyze the funnel gases, but with the exception of a possible ship or two, nothing has been done in the navy at large.

At this point it should be noted that most of the causes of waste of coal were well known, but that proper attention was not paid to their elimination. Gas analysis has since been employed to a considerable degree, and ships' competitions between watches have been instituted, the amounts of CO_2 being published weekly.

Lieut.-Commander Gillis further says:

It is believed that the assumption may be made that at least one-third of all the coal used is burned under conditions that permit of economy if proper attention is paid to details.

Not only will there be a saving of money for coal, but it must necessarily result that the greater care given machinery will reduce the cost of repairs to engines and boilers as well as to make them last longer.

. . . . the details would have to be carefully worked out and, no doubt, would require extensive modification from year to year as more was learned about the subject, as has been the case with the question of gunnery.

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* When the Atlantic Fleet began its cruise around the world, the fleet engineer was, in addition, the senior engineer officer of the fleet flagship. It was not until after the fleet reached San Francisco that the duties of the two positions were made separate.

At Rio de Janeiro, Brazil, in January, 1908, Rear-Admiral R. D. Evans, commander-in-chief of the Atlantic Fleet, issued a Fleet General Order, instituting an engineering competition for battleships, and a separate competition for destroyers. This is believed to be the first instance of the establishment of engineering competitions for several vessels, under definite rules. If there were other cases before this their effect was neither general nor lasting.

This General Order stated that:

> . . . . the efficiency of any vessel in battle is based, not only upon the performance of her battery, but also, to a very large extent, upon that of her engines and their appurtenances.
>
> . . . . her value as a strategical unit is directly dependent upon her economical use of such amount of coal, oil, and other similar supplies as it is possible for her to carry.

The competition for battleships combined the features of development of maximum speed under both forced and natural draft, economy of coal and oil under these conditions, and economy of coal under ordinary cruising conditions, at moderate speeds. Breakdowns in formation were penalized.

The destroyers were required to compete in maximum speed and economy of coal and oil at maximum speed, and in economy of coal and oil at cruising speeds. Torching at night, while running at high speed, was to be penalized.

The standards of economy were the performances while en route from Hampton Roads to Rio de Janeiro. Water received from an outside source was charged as coal at the average rate that it cost to distill aboard ship, and gain or loss in water between the time of beginning and ending the competition was credited, or charged, as coal at this rate.

As the vessels had all been docked at about the same time, and as they were constantly together and consequently encountered the same weather conditions, it was a simple matter to compare the coal economy of the several vessels. Interest in the scheme was at once apparent.

The competition ended at Magdalena Bay. The distance steamed was 8210.5 knots, and a total net increase in economy of 1460 tons of coal was realized. As there was no time for holding the full-power trials, no award was made, but the commander-in-chief, in a Fleet General Order, congratulated the officers and men of the fleet " on the interest they have shown in the matter

more than doubled their cruising radius, as far as oil was concerned.

The competition was again put into effect on leaving Manila, and, except for the period during which the divisions dispersed in the Mediterranean, continued until the fleet reached Hampton Roads. On account of the long time out of dock, the vessels were foul, and the fouling was unusually heavy because of the stay in Manila Bay. In spite of this, and in spite of the bad weather encountered while crossing the Atlantic, the saving in coal, compared with the performance from Hampton Roads to Rio de Janeiro, amounted to 5.6 per cent.

The saving in oil was more remarkable than at first; in fact, it is believed that one or two ships about reached the limit in this respect. 6269 gallons were saved over the performance from San Francisco to Manila, which means that 14,222 gallons had been saved over the performance on the voyage around South America. Several vessels had demonstrated that, with only their regular tank capacity, they could make the entire voyage around the world, via Australia, and still have oil left in their tanks on their arrival home.

It is useless to speculate as to the outcome if the voyage around the world had been made without competition. It was freely predicted, before the voyage began, that a trail of broken-down battleships would mark the course from Hampton Roads to San Francisco. As the break-downs that were to afford this humiliating spectacle could have referred solely to machinery casualties, it can be inferred that the state of efficiency of the engineering branch of the navy was under grave suspicion in certain quarters. The fleet actually made three times the mileage that was involved in the cruise around South America, and adhered to a schedule of dates of departures and arrivals almost without a break.

It is natural, perhaps, that a voyage of this character should develop the resources of the ships, and tend to force them to be self-supporting. And natural, also, that there should be a saving of fuel and oil, due to continued practice in running the machinery, and firing the boilers. How much of the actual improvement was due to the voyage, and how much to the competitions, can never be ascertained. But previous voyages, of considerable length, had failed to produce a proportionate amount of improvement.

The saving in oil was almost entirely due to competition. Although the run from Rio de Janeiro was made with economy of coal as one of the factors of the competition, economy of oil was not encouraged by the rules, and it is a noteworthy fact that no saving in oil was effected on this run. It was a bold stroke to place a premium on cutting down the oil consumption of a high-powered vessel, but the new rules, issued at San Francisco, did this very thing. It was pointed out that cruising radius depended on coal rather than on oil, and that there was no real economy in burning up bearings to save a few gallons of oil. But competition started the engineers to experimenting carefully, with the result that the vast quantity of oil that had hitherto been splashed on the floor plates, and pumped overboard from the bilges, was left in the tanks for future use. There were scarcely enough hot bearings during the entire voyage to make the matter worth mentioning; there were no more after leaving San Francisco than there were before.

An engineering competition in the Pacific Fleet was instituted shortly after the Atlantic Fleet left San Francisco. Performances during a voyage of over 9000 miles, ending in November, 1908, showed marked improvement on the part of the eight armored cruisers, and, after the completion of the voyage the competition was again put in force.

On the first day of July following the return of the Atlantic Fleet to home waters, the Navy Department directed that the first official engineering competitions begin. The drawing of rules, the computing of standings, and the publishing of results, were entrusted to the director of target practice and the two great factors of battle efficiency, gunnery and engineering, became identified with each other from this time on. The rules were made confidential, as it was recognized that methods having the greatest bearing on battle efficiency were being developed because of competition.

The third official competition is now in progress. Battleships and armored cruisers, cruisers, destroyers, and submarines now compete during each fiscal year, and handsome bronze trophies are awarded annually for superiority in the different classes. The deserving members of the engineer's force of trophy-winning vessels wear, throughout the year, a red "E" on the sleeve, and the trophy-winning vessel is distinguished by a red block letter

BATTLESHIP ENGINEERING TROPHY.

"E" on the after smoke pipe. In addition, the vessel receiving the highest combined final merit for gunnery and engineering is awarded the battle efficiency pennant, the greatest distinction that a vessel can receive.

For the year 1909-1910, the *Nebraska* was declared the winner in the battleship class, and the *Preble* in the destroyer class. For 1910-1911 the *North Carolina* was the winner in the battleship class; at this writing the scores of the other classes have not been computed. Reports, however, indicate that the competition for submarines, first instituted October 1, 1910, caused these vessels to perform an amount of surface, submerged, and awash work, hitherto unheard of.

The *Michigan* was awarded the battle efficiency pennant for the year 1910-1911, and with this distinction went a commendatory letter from the President of the United States. The captain and nine other officers of the *Michigan* had copies of this letter placed on their records, as a testimonial to the fact that they were directly responsible for making the *Michigan*, "with the material at her disposal, the most efficient battleship in guarding the country's interests."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A NOTE ON SALVO DISPERSION.

By ENSIGN GARRET SCHUYLER, U. S. Navy.

As modern long-range salvo firing is of such comparatively recent origin, it is not surprising to find that in treatises on the accuracy and probability of gun-fire there is little or no mention of the now important questions of the effects of salvo dispersion, the dispersion of maximum efficiency, and how this compares with dispersions actually obtained in practice.

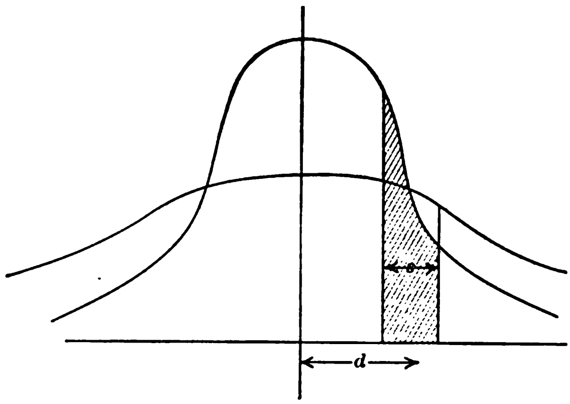

FIG. 1.

If we consider the center of the danger space *s* at a distance *d* from the center of a salvo, and draw ordinates (Fig. 1) to represent the distribution of the impacts, then the shaded area included between ordinates limiting the danger space will represent the number of shots hitting the target, while the whole area of the curve represents the number of shots in the salvo. This shaded area showing the number of hits can be the same in the case of a high but steeply descending curve representing a well-bunched salvo as in the case of a lower but less steeply descending

curve of equal area representing a more scattered salvo with center in the same place. Thus, in general, there are two values of the mean dispersion corresponding to a given percentage of hits on a target of danger space s by salvos striking with centers d distant from the center of the danger space. (For instance, as an extreme, zero hits can be made either by bunching off the target infinitely well, or by having infinite dispersion.) Intermediate between dispersions too great and dispersions too small, giving the same percentage of hits in danger space s when the salvos land d distant, there is one particular value for the mean dispersion that will give a better percentage of hits than can be obtained by using any other value for the mean dispersion.

We will call this γ_{max}, the "dispersion of maximum efficiency," and will calculate its value.

On page 129 of Alger's Exterior Ballistics is a table of "probability of a deviation of less than a," P, the probability, being given for different values of $\frac{a}{\gamma}$ where γ is the mean dispersion. Using this formula, the percentage of hits is

$$\frac{P\left(\frac{d+s/2}{\gamma}\right)-P\left(\frac{d-s/2}{\gamma}\right)}{2} \quad \ldots \quad 1$$

and using $d=200$, 500 and 1000 yards, and $s=60$ and $s=120$, we get by repeated trials in picking out successive values of γ till we locate values of γ_{max} corresponding to maxima in P_1 as follows:

d	$\gamma\ max$	P	d	$\gamma\ max$	P
200	.160	.073	200	.155	.015
500	.420	.030	500	.385	.058
1000	.825	.015	1000	.770	.029
	$s=60$			$s=120$	

These results show that for all usual values of s, and for salvos within 1000 yards of the center of the danger space, we can say, with an error of less than about 3%, that *the dispersion of maximum efficiency is equal to $\frac{1}{5}$ the distance from center of salvo to center of danger space* (also P can never exceed $\frac{1}{4}$ of $\frac{s}{d}$).

Now, interesting ourselves in the "Report of Observers" for one ship's day battle practice, we have as follows:

	s	d	γ
12″	120	144	42
8″	120	242	88
6″	140	139	93

The fact that the average value of γ is less than $\frac{4}{5}$ of the average d suggests the possibility that if there had been more dispersion the score would have been higher. As this is a little unexpected, it may be well to investigate the firings in detail, calculating P for each salvo, and then calculating it again with a value of γ assumed as $\frac{4}{5}$ of the average d for that caliber.

12″	s=120	4/5d=120		8″	s=120	4/5d=194		6″	s=140	4/5d=112	
Distance from center of danger space.	Mean dispersion.	Probability of hits.	Probability with 120 yds. assumed dispersion.	Distance from center of danger space.	Mean dispersion.	Probability of hits.	Probability of hits with 194 yds. assumed dispersion.	Distance from center of danger space.	Mean dispersion.	Probability of hits.	Probability of hits with 112 yds. assumed dispersion.
d	γ	P_γ	P_{120}	d	γ	P_γ	P_{194}	d	γ	P_γ	P_{112}
7	17	.993	.310	427	22	.000	.044	97	122	.293	.307
−147	262	.133	.198	435	25	.000	.040	45	165	.259	.365
−110	0	.000	.239	127	48	.132	.171	−195	150	.176	.157
15	25	.916	.309	110	25	.056	.180	−187	103	.159	.167
−160	25	.001	.182	85	100	.297	.185	− 03	73	.556	.383
−35	0	1.000	.302	− 48	62	.479	.191	−100	93	.327	.302
102	62	.275	.250	− 72	32	.881	.189	150	74	.186	.226
−385	0	.000	.014	197	16	.000	.141	222	83	.071	.124
−310	42	.000	.042	572	46	.000	.013	280	37	.000	.052
−185	25	.000	.152	435	36	.000	.040	172	67	.111	.192
−185	0	.000	.152	310	36	.000	.088	114	58	.261	.283
				280	25	.000	.096	108	100	.310	.286
149	42	.303	.182	172	54	.050	.151				
				135	00	.000	.166	139	93	.225	.237
				225	37	.000	.128				
				242	38	.093	.121				

From the above it is plain that in the case of the ship in question greater dispersion *would* have raised the score for 8″ and 6″, but not for 12″.

Granting that one dispersion is more efficient than all others, we may inquire how much more efficient it is. For instance, if a salvo lands 500 yards from the center of the danger space we know 400 yards mean dispersion gets the greatest number of hits. What percentage of that number will be obtained with a mean dispersion of 200 yards, or 800 yards, etc.? Let $d=100$ yards and $s=60$ and 120 yards, then from the above we judge the form

γ Mean dispersion.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.
	$s=120$	$s=60$
80	1.00 %	1.00 %
160	.72 %	.71 %
240	.52 %	.51 %
400	.32 %	.32 %

of the function to be fairly constant. By plotting on a large scale we get the following results:

Mean dispersion expressed as a per cent of distance of salvo off target.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.	Mean dispersion expressed as a per cent of distance of salvo off target.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.
% γ/d	% $P/P\,max$	% γ/d	% $P/P\,max$
10	.02	90	.98
15	.04	95	.96
20	.06	100	.94
25	.10	105	.92
30	.20	110	.90
35	.36	115	.88
40	.52	120	.86
45	.65	125	.84
50	.77	130	.82
55	.83	135	.80
60	.89	140	.78
65	.93	145	.76
70	.97	150	.74
75	.99	155	.72
80	1.00	160	.70
85	.99		

The results quoted above being from but a single ship cannot be generalized on too far and taken as representing all ships, but since the scores were perhaps closer to average than to either best or worst it is surely not unreasonable to suppose that there are other cases like this one where more dispersion would have meant more hits.

Whether to increase the dispersion would or would not harm the score cannot be merely a general matter of opinion or mere prejudice against any dispersion at all, *per se*, but must be judged in different cases according to the different values of d and s and γ in these instances.

The claim is quite commonly made that to bunch a salvo always helps the score because it makes spotting easier. Unmodified, in this form, this is merely an unsupported statement of an opinion hardly applicable to all cases. For considering all the elements of spotting and range keeping it is by no means to be taken as axiomatic that the spotter will profit from the decreased dispersion and get a decrease in mean distance from the target sufficient *in every case* to more than overbalance the disadvantage that decreased dispersion might handicap him with.

Just what the best dispersion is for a single salvo is easy enough to decide. We have seen it to be $\frac{4}{5}\ d$. It does not follow, however, that for a series of salvos, the best results will come from making the mean dispersion in every salvo equal to $\frac{4}{5}$ of the average value of d. To state this as it is frequently heard, "The one or two bunched salvos that might get on the target would count so much when they *did* hit, that to disperse all salvos more, even though perhaps helping in all other salvos but the one or two hitting, might or might not pay in the long run." Trial and error is the only practical method of determining the dispersion of maximum efficiency for a series of salvos, but there *is* a dispersion of maximum efficiency not zero, and the whole point of this article is to bring this to mind.

No wild scheme of purposely bore-sighting to disperse is suggested from this limited amount of data. No general denial is made of the merit as a working principle of the current idea of trying to "bunch the shots" in the salvos. It is merely suggested, however, that there are occasions when both sides of the matter should be understood.

For instance, if ever from the results of a whole target practice we should decide that the mean dispersion was as small as, or smaller than, the dispersion of maximum efficiency, would it not be appropriate that the following year's rules put a greater premium on rapidity of fire (with its accompanying increase in dispersion)?

Suppose again that the question came up of rebushing trunnions of turret guns because it was feared that the wear in the bearings had caused errors that would make dispersion. Would not it make one go a bit slow in spending thousands of dollars on the job, taking out guns, face plates, etc., to realize that the increased accuracy might prove harmful?

When guns have been fired till it is feared some dispersion may result from their bores being worn, the question of relining comes up. Shall we pay $10,000 per gun for decreased dispersion or is it not worth it? Or might it not be detrimental to fighting efficiency as well as expensive, to cut down the dispersion by putting in new lines? At what stage should the guns be relined? These and similar questions are all involved in this matter of the effect of salvo dispersion, and their importance seems to justify the systematic collection of data and their further study.

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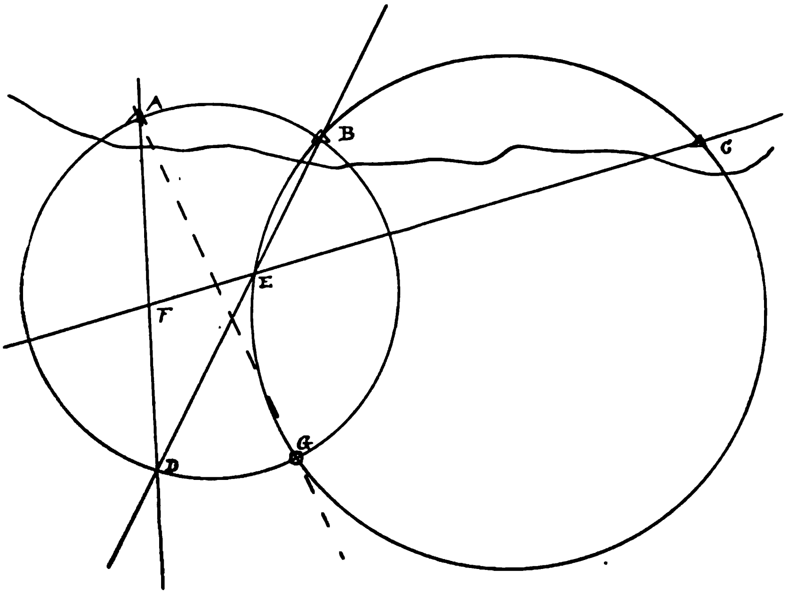
WHEN PLOTTING THREE BEARINGS AND THEY FAIL TO CROSS IN A POINT.

By COMMANDER G. H. BURRAGE, U. S. Navy.

There is a very general idea that when plotting three bearings and they fail to cross in a point, that the probable position is the middle of the triangle so formed, and that an error in one bearing has probably been made.



... an exaggerated case, *A*, *B* and *C* being points on shore, ... *C*, the plotted bearings forming the triangle *DEF*.
... arings taken as representing horizontal angles,
... *D* will give all possible positions of *D*.
... ve all possible positions of *E*.

The point of crossing of the two circles at *G* will be the position required, and the angle *DAG* will be the compass error that should have been applied to each of the bearings so that they would cross in a point.

An inspection of the triangle will easily give the intersection without actually drawing the circle.

When the bearing of the center object cuts to the right of the intersection of the other two bearings, the position is to the right of the triangle; and when it cuts to the left, the position is to the left of the triangle.

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SOME CONSIDERATIONS AFFECTING THE NAVY PERSONNEL.

By Captain Roy C. Smith, U. S. Navy.

There seem to be several shades of service opinion in regard to personnel measures, varying from indifference, if not opposition, to passive sympathy, and finally to active support. This is not unnatural. We are all anxious for the good of the service, but we would rather have that good tend in some way to our own welfare as well. We are perfectly sincere in this, and we cannot help scanning proposed measures to see how they are going to affect us in this regard.

The personnel bill introduced in the last session of Congress has the intention of promoting the good of the service. If any of its features do not promise to accomplish this end, they ought to be modified. Also, the good of the service has been made to include, as far as possible, the good of the individual. This is the point that has given rise to doubt in some instances, and is the foundation of most of the objections that have come to the notice of the writer.

The line personnel may be divided generally into three groups; first, those who were in the service before and were not affected by the legislation of 1882; second, those who were affected by this legislation, and those following them down to the present large classes; third, the present large classes, beginning with the class that entered in 1903.

Among the first group there is little opposition to the measure, so far as is known. For a year or two there would be a ten per cent elimination from the grade of captain, which would then cease for a dozen or more years; and there would be a continuous fifteen per cent elimination from the grade of rear-admiral *This amount of elimination is less than by existing law,*

and will be very materially less when the eliminations cease in the grade of captain, that is, in a year or two. There are also other advantages; voluntary retirements take place at any time during the year, and captains of over thirty-seven years' service retire as rear-admirals.

These provisions will bring officers to flag rank continuously by the age of fifty-five years. The statement is sometimes heard that we have flag officers now as young as fifty-six, and that they will continually get younger; that captains now being promoted have passed through the grade of captain in four years, and as captains are now reaching their grade at the age of forty-eight, they will be rear-admirals at the age of fifty-two. The trouble with this line of reasoning is that the time of reaching the grade of captain has no necessary connection with the time of reaching flag rank. If eighteen rear-admirals are allowed, and the classes at the top of the list average nine members, it is obvious that flag officers will average two years in their grade (eighteen divided by nine equals two). Similarly, if the classes average six members, they will spend three years in the grade, and so on. Hence, the only considerations affecting the time of reaching flag rank are the number of flag officers allowed and the size of the classes at the time in that rank.

A glance at the Navy Register will show that the present classes at the top of the list average three to four members, which explains the fact of some of the present flag officers having five or six years to serve. But the classes of 1876 to 1879 inclusive average about ten members; so when these classes are reached, we shall be right back to the old conditions, that is, flag officers having only a year or two to serve before retirement. Any officer may form an estimate of the time he is apt to spend in flag rank by consulting the Navy Register and considering the size of the classes immediately preceding his own.

The officers of the second group are generally indifferent to the measure. The earlier classes were depleted by the legislation of 1882, which has given all the group rapid promotion. Present conditions being entirely satisfactory, they are content to let the future look out for itself. They do not like the graded retirement features, which they consider unfair and a violation of an implied contract. When shown that these graded rates would probably not affect them, but only the third group, they say they

are not objecting for themselves, but as a matter of principle. It is a pity that because they are satisfied with the present they will not have an eye for the future as well.

The third group might be subject to graded retirement in ten to fifteen years, depending on the growth of the navy. *No complaint is heard from this group.* They realize that promotion for them under existing conditions is hopeless. The only method for any of them to be promoted in any reasonable time is for some of them to retire. Generally speaking, *they are willing to take their chance* on graded retirement since they realize that without some such plan they will spend their lives in the lower grades.

There remains something to say about vested rights and implied contracts, as well as the general fairness of the graded rates. Implied contract means that when an officer enters the service he is to be promoted in time to all the grades, barring misconduct, and is to be retired eventually on three-fourths pay. An officer who has served for some length of time under this implied contract acquires vested rights. It is not necessary to decide whether such a contract and rights really exist. It would be to the security of the individual, certainly, if they did exist; and it is desirable to continue to uphold them.

If they do exist, they have been violated in the existing personnel law, in retiring officers in advance of sixty-two years of age. Retiring them at graded rates of pay less than three-fourths of full pay would similarly be a further violation of such rights. The question now is whether such a violation, if it is a violation, is for the best interest of the whole service. If it is for such best interest, there is a precedent for it in the existing personnel law, and the matter of implied contract and vested rights may be left just where it stands at present.

It may be assumed that Congress will not authorize any law that increases the cost of the navy. If reasonable promotion is to take place, there must be some form of early retirement. If such retirements are at three-fourths pay, the cost of the navy will be materially increased. The graded rates of pay of the proposed personnel bill do not increase the cost of the personnel, number for number. Hence, graded rates seem to be the only recourse. The other alternative is to leave things as they are now, that is, to do nothing.

As to the abstract justice of the rates, the lowest rate is thirty-three per cent of $3900, that is $1287, after eighteen years' service. From this rate there is a gradual increase to three-fourths pay. Is $1287 a year too little for a man averaging thirty-five years of age and the first of his time and date whose services can best be spared with the least loss to the government? In natural justice, it is evidently liberal. It is, of course, not three-fourths pay, but that is going back to vested rights. If the officers who will be the ones to be affected, that is, the third group as above described, are willing to take their chances for the sake of the evident advantages to those who would remain in the service, then it would not seem that the second group, who only want to be let alone, have any just cause of complaint.

This matter of graded pay may be looked at from another point of view. Retirement pay is not pay at all in the sense of remuneration for services currently rendered. It is really a pension for services previously rendered. This has been upheld by the courts in a number of instances. The rate of pay actually received at the date of retirement may or may not be a measure of the whole service previously rendered, but the total pay that an officer has received during his whole service would be a just measure of such service. If each officer, under this assumption, were to be informed that hereafter an amount equal to fifty per cent of his pay for each year of his whole service would be set aside and paid him on retirement, he probably would be extremely satisfied.

Examining the graded rates of the bill from this point of view, the steps would be to compute the total pay of each officer from the date of graduation (when his real service begins) for each year up to the age of sixty-two years. Next, the graded rates regarded as an annuity would have to be capitalized. It will not be necessary to assume a rate of interest for this, as a comparison is all that is wanted. The annual pay multiplied by the expectation of life at the date of retirement will give the total amount to be paid.

Having made these computations, it will be seen that a rear-admiral of the upper half, retired on three-fourths pay at the age of sixty-two years, will receive forty-three per cent of his total previous pay on the active list, and that rear-admirals of the upper half retiring in advance of sixty-two years will average

fifty-five per cent of their previous pay. Similarly, rear-admirals of the lower half will average sixty-one per cent of their previous pay. Captains, most of whom will have served over thirty years and will be drawing three-fourths pay, will average eighty-one per cent. Commanders under the graded rates will average ninety-nine per cent. Lieutenant-commanders will average one hundred and six per cent, and a lieutenant-commander of eighteen years' service will receive one hundred and fifteen per cent.

Hence, from this point of view, the graded rates are liberal in the extreme, and most liberal in the lowest grade to the officer of the least length of service of any to be retired under the operation of the law.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CHECKING-IN.

WITH SPECIAL REFERENCE TO SHIP YARDS.

By Asst. Naval Constructor R. D. Gatewood, U. S. Navy.

One of my workmen the other day made this remark to me: "I've worked in 14 different plants and I never saw two alike when it comes to checking-in," and the surprising thing is that he may work in 14 more and his remark will still hold good. There has probably been as much thought expended over this matter of "checking-in" as over any other single detail common to all plants, and the number of systems in use is a remarkable tribute to the diversity of human opinion and the ingenuity of the human brain.

I have before me the details of the methods used in 12 large ship-building plants. Each one is different, essentially so, and the pre-eminence of each over its rivals is more or less complacently taken for granted by the firms concerned. There is something not unnatural—indeed, there is something worthy of respect—in this view. Each system is as much a part of the particular firm as is its output, having been developed by the members of the firm to suit its own peculiar needs, and to question the means employed in so elemental a thing as "checking-in" is to cast a reflection on the management.

The fact remains that each of the systems is different, and it is only human to ask for a reason. The plants are alike. The trades employed are the same. The number of men does not differ greatly. The nature, volume and general lay-out of the work done in each plant are not unlike. The systems of checking men in to work are different. Why?

Are there not certain principles upon which all systems of checking-in must be based; certain primary requirements that all must meet, and, going still further, is there not some one "best system" for such a set of similar plants?

NECESSITY FOR A CHECKING-IN SYSTEM.

PURPOSE OR OBJECT ATTAINED.

A. It is of manifest advantage to determine at the outset wh we want a checking-in system at all, and what purpose we wish attain. Before seeking a tool to accomplish a piece of work, o should first know exactly what work he wishes to accompli Unless this is done confusion is likely to result from our taki into consideration some apparently sparkling system that cap vates the fancy by promising to accomplish some useful b foreign and unexpected result, while the primary and more i portant necessity is but indifferently cared for.

Aa. The primary purpose of any checking-in system is to fu nish certain specific information; namely, information that cert employes have reported for work at or before a definite time.

The necessity for such a system is threefold: (1) Furnish early information to the supervisory force as to what employ have reported for work and on time; (2) furnishes early inf mation to the accounting department which will expedite clerical work of cost keeping and making up pay rolls; (3) for one single but valuable link in a more or less complete chain evidence which is accepted as proof of an employe's presence work and used as a basis for signing the pay roll. It may noted that any system fulfilling (1) may be expected to fulfill (and (3). (As to records of exact time, see "time clocks," late

Ab. While there may be no question as to the threefold nece sity above outlined being the primary object to be attained, t query will naturally be put, "Have we exhausted all the possibi ties of a checking system?" By no means. We can demand our system that it serve other purposes more or less valuable; fact, there is no limit to the almost infinite number of requir ments with which we may burden our poor system, but such a ditional purposes can hardly be considered of primary necessi nor a logical requirement of a checking-in system.

Ac. For instance, a time clock located on the job may be ma to serve the additional useful but foreign purpose of recording t exact time devoted to that particular job. The additional inform tion thus gained is: (1) Exact cost of job (sometimes). (Detect loafing of workmen (perhaps). This information wou be extremely useful, but it is not fair to require the checkbo to furnish it. We want a check system to accomplish a cert

distinct purpose, and it is for the perfect performance of that purpose that we must judge our system, and not be biased because it can perform some other unexpected piece of work, no matter how useful.

If we hire a first-class ship-fitter, we would hardly be satisfied to find the man a first-class boiler maker but an indifferent ship-fitter. Manufacturers and inventors are constantly placing on the market combination tools and machines—a dozen tools in one or a machine that will do the work of twenty. These are seldom used by any but unskilled amateurs or those turning out a small volume of work. Where special work is constantly performed, special tools, special machines and special men are necessary.

So with a checking system. A plant as large as any of the larger government navy yards, or any of the prominent private yards, checking-in several thousand men daily, requires not a general all-around combination system, which will accomplish a variety of useful things, but a special system which will accomplish in the most perfect manner possible a specific result.

INFALLIBLE SYSTEM IMPOSSIBLE.

B. It is valuable to determine in the beginning just how perfect a system we can hope for, and thus save ourselves from seeking what might prove to be impossible.

Any system of checking must depend upon one or more of the human senses, as well as upon human intelligence.

Human senses and human intelligence are neither uniform nor standard, but vary greatly in quality. A few men are almost (but never quite) infallible; others again can never be depended upon. Often, indeed, the fallibility of the same man will vary daily, like a barometer, and all managers in charge of large offices know that 80 per cent of the clerical errors are made between 11.30 and 12 a. m. and 4.30 and 5.00 p. m.

A chain can be no stronger than its weakest link, nor a house more stable than its foundation; neither can a checking-in system be any more infallible than the imperfect human brain, eyes and hands on which it must depend.

The necessary time clerks employed to operate any checking system, being human, are no more infallible than others, and therefore contribute their full share to error.

It is self-evident that if reliance is to be placed upon the work

of a time clerk he should be a man selected for accuracy, and thi quality in him tested rigorously and proved. *The ordinary employe is hired not because he can check-in without error, bu because he can do some other work well,* while a time clerk i employed solely for the purpose of securing accurate time.

SYSTEM WHICH CANNOT BE BEAT.

Ba. Since it is impossible to devise an infallible system it equally impossible to devise a system which cannot be "beat. Human ingenuity can never invent any system that human brai cannot find a method of outwitting. Not long ago vault builde thought they could build an impregnable vault. Almost immediately the oxy-acetylene flame exploded this idea.

Bb. Thus while it is impossible to devise a bank vault that cannot be broken, a coin that cannot be counterfeited, a checking-in system that cannot be "faked," we can at least hope for thi: *To make "faking" so difficult that, although not impossible, it will not be practical.* (See Dd and De.)

DIFFICULTY IN SELECTING THE MOST PERFECT SYSTEM.

C. It is impossible to know for a verity that you have the most perfect system obtainable. This is entirely a matter of comparative judgment, time and place. We must be satisfied with something better than anything ever invented in the past. To invent a checking system for all conditions of time and place is not possible.

GENERAL REQUIREMENTS.

D. There must be some general requirements or rules applica to all systems, and if these can be determined upon and clea stated, they will serve as a valuable criterion by which to test a proposed system. The following is a statement of the most important of these requirements:

Da. *Eliminate Error.*—The system should be such as to eliminate error as much as possible, and to make accurate work ea

Dc. *Easy to Discover and Trace Error.*—It should be an ea matter to discover error early and to trace it rapidly and ine pensively and rectify same.

Dd. *Simplicity.*—The operation of checking-in must be sim and yet not so much so as to be altogether mechanical. No sin

system, however complicated, can be solely relied on, and absolute accuracy can only be obtained by multiplying the means of determining an employe's presence at work, and in the case of conflicting testimony accept the preponderance of evidence as conclusive.

De. *Multiply the Number of Men Responsible for Accurate Checking.*—By multiplying the number of time clerks, attendants, leading men, etc., within the limits of economy, errors are more readily eliminated and a more positive check secured on accuracy.

Df. *Durability.*—A delicate or complicated mechanism is not desirable. (See "time clocks," later.)

Dg. *Economy.*—From the point of view of economy any system must be considered in three lights, (1) initial cost, which includes, of course, purchase price and installation, (2) operation, which includes the number of time clerks and attendants required, and (3) maintenance and repairs.

Dh. *Location. Central Station.*—There can be no question but that the best location of any checking system is as close as possible to the one general entrance to the plant, such as the checking station at the Mare Island Navy Yard. (See Fig. 2) Where the plant has more than one entrance, the number should be restricted to as few as possible, and checking-in done *at the entrances.* At times men are almost certain to forget to check-in, and this the central checking-in station corrects, with all the men dropping their checks and the board staring a man in the face as he enters the plant. Also in a large plant, where a large proportion of the work is *outside* the shops, a central checking-in station obviates the loss of time of a man going to his shop at one end of the yard to check-in and returning to his job on a ship at the other end of the yard. After working at the Mare Island Navy Yard with the check boards in the shop and later with the central checking-in station, the writer estimates the saving due to this system per man for an outside force of some 800 men at not less than four minutes per day—truly a considerable item.

Di. *Ground Space.*—Economy would select the system demanding a minimum of ground space, but efficiency requires a certain liberality in this respect.

Dj. *Light.*—Since any checking system must depend upon the sense of sight, it is evident that such a system should be well lighted, and not hidden in some obscure or dark corner.

Dk. *Sight.*—Since any checking system must depend on vision, it is evident that whatever apparatus, checks or figures are used should be constructed so as to be easily distinguished. Size, shape, color and general arrangement should be such as to assist clear vision. For instance, if a large board is used, holding 500 checks, it could be so striped or checkered with several catchy colors as to greatly assist the eye in rapidly locating a desired position. It is not believed advisable to vary the shape of the checks, as this will render it too difficult to take a muster of the board.

Dl. *Time of Checking.*—It is desirable to have the checking operation performed early in the work day, preferably on entering the plant (see Dh) and a few minutes before starting work (see Aa).

Dm. *Recording Exact Minute of Checking not Necessary.*—Time clocks are not a necessity at a central checking station, certainly not at a navy yard. Such a clock will record the exact minute an employe enters the plant. This is unnecessary and useless information. It is desired to know that an employe has reported within the limits of the plant *before* a certain time. Whether he reports at 7.55 or 7 o'clock is not material. Clocks are useful where an employe is permitted to go to work as soon as he reports, or to remain at work as long as he likes, but their chief use is in the shop, and not infrequently the *repair* shop at that.

A good pair of scales to record each employe's exact weight as he entered the central checking-in station every morning and left each night would be quite as useful as a time clock—perhaps more so. If a man quit work each night weighing two or three pounds less than when he reported for work, it might be assumed that he lost weight due to working hard. Again, if a man showed a steady gain in flesh after several months in a navy yard, his case might bear looking into. It could be so arranged that the weight could be automatically printed on individual time cards, and men increasing in weight would have this printed in scarlet. Red would mean "Danger; investigate your man!"

Dn. *Speed of Checking-in.*—Economy of time would demand a system requiring a minimum of time for the operation proper. On the other hand, efficiency (or accuracy) sets a limit on this time. A checking system depends upon the human intellect and senses. As all these functions require time for their performance, it is evident that there is a minimum time beyond which we can-

not go without a sacrifice of accuracy to speed. The former is *essential.*

Do. *Speed and Ease of Muster.*—The type of board and check must be such as to facilitate a speedy muster being taken immediately after the board is closed (see Aa) and if possible by one man.

Dp. *Loose Checks.*—Whatever is loose will be lost. A system involving loose or removable checks is not as desirable as one in which all parts are permanently secured to the board.

Dq. *Check should be out of Reach when Once Turned.*—Once a man has turned a check it should not be possible to again tamper with it at that muster.

The photograph (Fig. 1) shows a system in which a man can turn his check on entering the plant, and another man, either through carelessness or intent, can turn the check back. Thus it is possible for both men to believe themselves checked in, and to be actually at work, although the board shows them both *out.* Again, when a man's check is found unturned he can state that he turned his check, but another man turned it back, and this lack of conclusiveness of the fact renders the muster of doubtful value, and prevents the management, in all fairness to the men, from enforcing strict rules.

Dr. *Number of Musters. Necessity for Checking-Out at Night.*—Checking-in in the morning merely indicates that an employe has reported for work. Checking-out on leaving the plant is another link in the chain of evidence, and is proof (partial, not conclusive) that the employe has spent the day at the works. A man might go home an hour early—the check at night shows this.

Ds. *Necessity for Checking-out at Noon.*—For the same reason that a man checks-out at night, a careful management would require him to check-out at noon, provided he was *not* to return again in the afternoon. For the other men who *do* intend to return, this checking out at first appears unnecessary, but if the rule is not made general the man who is *not* to return would invariably forget to check-out. At plants using individual time cards, employes leaving at noon rarely remember to leave a time card for the morning's work. Suppose he goes home at noon, intending to return at one o'clock. He meets a circus parade and changes his mind. It is hardly likely that he will return and check-out. When it is customary to check out at noon

every man gets the habit, and the man going home at noon checks out with the others. For those who return, neither advantage nor harm is done, while for those who do not, their check indicates that fact.

"After careful comparison of the merits of the various systems shown and others that have been investigated, it is believed that a combination of the central checking-in station idea and a system similar to that adopted by the Washington Navy Yard presents, by far, the most satisfactory solution of this difficult and complicated problem, for ship yard purposes where a large proportion of the force is working outside the shops."

THE CHECKING-IN DEVICE AS USED AT THE WASHINGTON NAVY YARD.

This register is so simple as to hardly need any explanation. A child can operate it. It is exceptionally durable. Nothing to wear out or get out of order. Its serviceability therefore is almost limitless.

The construction involves a backing of sheet brass installed in a hardwood case. The sheet brass backing has rows of inverted V-shaped slots cut therein, in which the checks slide by means of a specially formed rivet.

One half of each slot (the inverted V) is exposed, the other half is hidden by a frame of metallic slats, so arranged that it can be slid from one side to the other, exposing always one-half of each slot.

The riveted checks ride freely in the slots but cannot be taken from the board by anyone without authority. There is provided a place in one of the lower corners of each slot, with a spring attachment for removing or replacing the checks; the spring has to be pushed back by a pointed instrument to release the rivet, after which the check can be removed or replaced.

A glass paneled sliding door is provided which completely covers the register and prevents tampering with it when not in use. The right hand side of the cabinet is used as a bulletin board for posting orders or notices to employes.

The cost of maintenance is almost nothing, and the prices of the registers are within the reach of any institution, business, factory, schools, or others, so there cannot be anything prohibitive in their use. There are no clock works or mechanical con-

trivances to get out of order or create embarrassment. It is absolutely positive in its action and results.

FIG. 1.

The Washington, D. C. Navy Yard, U. S. Naval Torpedo Station, Newport, R. I., Charleston, S. C. Navy Yard, Union Twist Drill Co., Athol, Mass., Boesch-Lomb Optical Co., Rochester, N. Y., and other places have been using these registers for

FIG. 6.

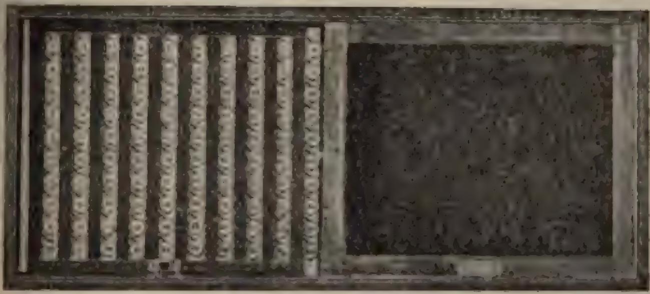


FIG. 7.

FIG. 8.

some time and all reports thus far received have been extremely favorable.

Fig. 1 shows details of check board used at Central Checking-in Station, Mare Island Navy Yard. The tin tags covering the numbers and the pieces of tape on the staples are used to show "dead" or unused checks. See Dq. The operation of checking in or out is performed by turning the check face outward over on the other half of the staples.

FIG. 2.

Fig. 2 shows the Central Checking-in Station, Mare Island Navy Yard. Fails to meet requirements Da, Dg, Dh, Do, Dq.

Fig. 3 shows a line of workmen at Cramp's Ship Yard about to check-in. This is done here at several entrances by the men calling their check numbers out as they pass through the check house. The number is written down by a clerk in the time-keeping department. Two musters a day.

Fig. 4 shows check house of outside machinists at Newport News Shipbuilding and Engine Co. Outside machinists and shop machinists are handled as separate departments. Shop machin-

FIG. 3.

FIG. 4.

ists have a check box located within the shop. Outside machinists known as steam engineers have a small check house located in yard central to the ships; and all men employed in the steam engineer's department pass through check house before starting work a. m. and p. m. Each man as he passes through this house takes from hook a brass check bearing number which has been previously assigned him at the time of his employment and de-

FIG. 5.

posits this check in a box at the exit end of the check house as he passes out.

Fig. 5 shows the Common Sense Register as adopted by the Washington Navy Yard and represents an employe in the act of registering, simply using his finger to push upward the numbered check to the apex of the inverted V-slot, when it passes over the apex and drops down in the other side of the groove or slot behind the metal slat.

Fig. 6 represents the register after the employes have registered, the checks which remain visible showing the absentees.

FIG. 6.

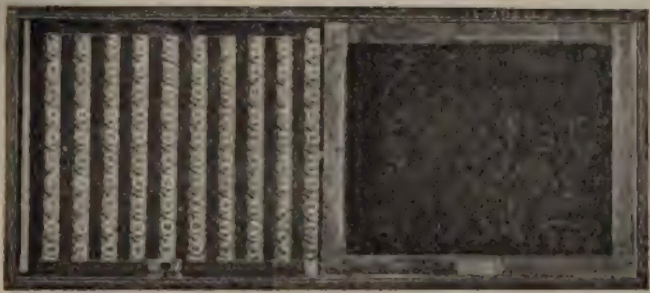


FIG. 7.

FIG. 8.

Fig. 7 represents the register before registering commence with all the checks exposed. All that was necessary to be do since registering, was to push over absentees' checks, after maki a note of them and slide the frame of slats to the opposite si No assorting of checks necessary. They are all in place ready f

FIG. 9.

the next turn to register, and occupying the same relative pos tions.

Fig. 8 shows the register with all the checks behind the metall slats, none being visible. This prevents the register being tam pered with.

Fig. 9 shows the register closed; all checks are hidden by th metallic slats, and glass door locked to prevent tampering.

DISCUSSION.

The U. S. Naval Academy Training.

(See No. 138.)

Lieut.-Commander W. T. Cluverius, U. S. N.—I must take exception to the form of question epitomized in this paper: "Is the present system at the Naval Academy the best one for achieving the purpose for which the government maintains it?"

I fail to find any discussion which establishes the necessity of an inquiry as to the success or failure of the *system* rather, it appears, this paper deals with the *operation* of the system chiefly in regard to the proportion of theory and practice obtaining and is an investigation into the curriculum and not the method of instruction. This latter has itself been under fire from time to time and has in its essential characteristics withstood the attacks.

A system in which the student is called upon daily and in which frequent examination—the accepted criterion—is a part is certainly more adapted to the enforced acquirement of the technical foundation of the naval profession than is a system, for instance, made up of lectures or similar means of imparting the knowledge of which the degree of absorption is voluntary.

For the efficient operation of the existing system the proper instructor is fully as necessary as in the other and in order that examinations be the standard of reference, they must be real indices of the work of the period embraced.

I refer, then, to the system as maintained at its highest state of development and with it in this condition it is believed that the paper considered does not take issue.

The chief criticism seems to be that the theoretical principles of the subjects taught are too little dwelt upon. It is granted that the course "gives the graduate a thorough practical foundation upon which to begin his career." I submit that this result alone is much to be desired.

In the naval profession, with its varied and special demands of a practical nature and wherein personal initiative is so distinctly a factor, the successful officer is the practical man.

The writer suggests that additional theoretical subjects be incorporated and that those now included, be taught more *in extenso* reducing if necessary the amount of practical instruction. He would thus balance the course.

Indisputably, theory is the basis of all knowledge and in the mastery of any profession, all endeavor must be founded upon it. The requirements of naval education embrace diverse technical studies deeply and differently rooted in the theory underlying many sciences. It is a problem

just how far to go into these theories to insure the amount necessary for their sound practical application.

I cannot agree with the writer that more theory is needed.

I believe, instead, that the inclusion of the maximum of theory consistent with the attainment of a thorough working knowledge of the various branches of naval science should be the standard sought in the operation of the Annapolis system.

It is my opinion that the midshipman does not properly digest the theory which now goes to make up his daily mental diet. If this is the case, then is the practice correspondingly affected.

The writer of the paper is satisfied with the practice acquired and desires more theory. I believe that even a greater amount of practical instruction should obtain and the amount of theory now included should be placed more securely in the midshipman's grasp.

In both considerations the time allowance imposes limitations.

There is, today, making its appearance, a national tendency to slow down a bit in covering the field of instruction. Our educational systems are comprehending depth of investigation rather than its superficial area. I mean that the governing consideration is becoming thoroughness rather than extent. This does not necessarily imply more theory but it does imply increased opportunity of assimilation of both theory and practice alike. There now exists in so many cases a smattering of both—a surface application, as it were.

This tendency must extend to the Naval Academy upon which institution the demands of the service are more insistent than ever before. To keep the pace of present naval activity, the step must needs be lengthened but it must also be sure.

The time limit must be changed.

It has been previously recommended and is again strongly urged that much can be accomplished in the indicated direction if the course at Annapolis be increased from four to five years maintaining the same curriculum adjusted to meet the changed conditions.

No compromise between theory and practice would be needed as more time becomes available for both with the proportion remaining as at present. There could be included in the course two practice cruises of five months uninterrupted duration, for instance, which would furnish an excellent equipment of practical ordnance, navigation and engineering of all kinds. If this, or a similar adjustment, would render the conditions for the student normal, then would mental digestion be restored and assimilation assured to so successful a degree that the midshipman commissioned at the end of the course would present an affirmative answer to the question as to whether or not Annapolis was accomplishing the object for which created.

PROFESSOR S. J. BROWN, U. S. N.—The article of Lieut. Logan Cresap on the course of instruction at the Naval Academy, recognizes the problem which is today common to all technical schools and colleges—the proper balance of theory and practice in engineering courses of study. The

number and diversity of new mechanism rapidly introduced in all branches of engineering has caused a tendency everywhere to throw the technical course of study strongly in the direction of details of construction and management rather than thorough study of the theory of such novelties. In the 5 years since the graduation of Lieut. Cresap, the Naval Academy course has hardened in the direction which his article criticises:—the practical course in electrical engineering, wireless telegraphy, has been added to the long established course in physics; ordnance has taken up the study of spotting and gun pointing, as an important part of the ordnance course; steam engineering has taken up explosive engines and turbines as an essential part of its course, until the course of instruction of the midshipmen at the Naval Academy has become too much congested for the best results. The cause of this has been that the shortage of officers has required the graduate to be prepared immediately on graduation for responsibilities beyond the training and experience usually derived from the four years of college life.

Now that the deficiency has been supplied, although the material is not yet all available as commissioned officers, it makes a convenient opportunity for taking up the question of theory versus practice in the Naval Academy course. It may be of benefit to consider the results of this demand for technical training upon the courses of study in technical schools and engineering courses in college. The student in these schools, having chosen his profession from natural ability or inclination, approaches the course of study with a recognition of its difficulties, and the necessity of a mastery of both theory and practice, if he is to succeed in the competition of life; on the part of the technical school is a recognition at the start of the necessity of thorough preparation and sufficient maturity to get the greatest advantage from the prescribed course of study, and that the graduate would have to serve a severe apprenticeship before gaining the degree which finally completes his professional course of theory and practice.

The lower limit of age of admission into technical schools is somewhat higher (17 years), than at the Naval Academy, and the mental examination covers a wider field; algebra (through quadratics), plane and solid geometry, elementary plane trigonometry, and elementary physics—an addition to the requirements for entering the Naval Academy, of solid geometry, plane trigonometry, and elementary physics. The candidate for engineering courses is further required to make 70 per cent in his examination in mathematics. The above qualifications are for the Massachusetts Institute of Technology, which fairly represents the requirements of the best technical schools, while for purely engineering courses in other colleges (Columbia, for instance), the minimum age of admission is 18 years. This usage of technical schools and colleges, in respect to age of admission and mental requirements, represents the experience of many years, and the conclusion in these respects ought to be of value to our Academy which is strictly a technical school—that maturity of judgment, and character and efficient preparation are necessary for the accomplishment of such a course of study.

Before the introduction of steam into the Navy, there was much rea- for the early age of admission then in vogue, 12 to 14 years, as education of the line officer began with the acquisition of the sea-g habit—getting a good pair of sea legs. But with time the constant crease in the mechanism of war, powerful, yet delicate and of wonde precision, has entirely changed in this respect the requirments of a and mental preparation. Unless the course at the Naval Academy made largely a theoretical one, and postgraduate study be made fo acquiring knowledge of widely diversified branches of engineering. we shall have to increase the mental requirements for admission and with it a slight increase in the average age of admission, 18½ years. If the present age is retained (or changed 17 to 19), the requirements should be more nearly those of other technical schools. So far as the preparation for the mental test is concerned, the amount of time now devoted to constant repetition of the very elementary subjects of plane geometry and algebra (through quadratics), would be much more advantageously employed in the application of these subjects to solid geometry and plane trigonometry, as it would vitalize those otherwise dry subjects by showing their simple extension into practical use. In such a case, the written test in these subjects, the examination covering the same length of time, would be better tests and easier for those having a real understanding of the subject, than the present more difficult examination in the narrow field. With these subjects out of the way, and the maturity of judgment which their accomplishment would represent, there would be found time for more thorough theory.

Whether or not the best naval officer will be the result of this intensely practical course or of a course where the required readiness is sought rather by a thorough foundation in theory, leaving the practical side of the profession to be acquired after graduation, is a question which can never be perfectly answered. If the naval officer of the future is to be ready at any time to perform the expert duties in steam engineering, electrical engineering, problems of engineering in ordnance, naval construction, or any one of the many lines which are becoming differentiated in the naval profession, it is manifest that the special knowledge required for these duties must be acquired after graduation, and must be left largely to the efforts of the individual. No four years' course of study with young men beginning between the ages of 16 and 20 could prepare any one, even in the theoretical requirements, for such a diversified calling, and the present course at the Naval Academy, with some modification, will give as a good foundation for that subsequent preparation as any other.

LIEUT.-COMMANDER W. B. WELLS, U. S. N.—The subject of this article is a very broad one, and the question, "Is the present system at the academy the best one for achieving the purpose for which the government maintains it," is only discussed from one point of view, viz., too little theory and too much practical in the class room. It goes without saying that we want practical men for naval officers. Admiral Melville's defini-

n of a practical man seems a good one. "The real practical man is e one who has so trained himself, both in theory and in practice, that is ready to solve the problems which come before him in his daily ork." To answer the author's question it will be necessary to analyze e course given.

It will be remembered that the Naval Academy is expected to take a y just passed sixteen (minimum age of admission), and give him: 1. A neral education. 2. A professional education. And the profession is a ry broad one.

To arrange a course to fulfill this condition is, to say the least, difficult. Granted that more theory should be taught. What should be omitted? ike the course in the department of marine engineering and naval con-uction with which I am particularly familiar and which is as follows:

ARRANGEMENT OF CLASSES BY TERMS, 1911-1912.

		1st Term.	2d Term.
Year......	4th Class	....	4 pers. Drawing.
Year	3d Class	4 pers. Drawing	3 pers. Mech. Pro.
Year	2d Class	3 pers. Prin. Mech..	5 pers. Mar. Engines and Boilers.
ı Year	1st Class	5 pers. Naval Con. Eng. Mechanics.	4 pers. Exp. Eng., Gas Engines and Turbines.

The time allotted to this department is probably a fair share considering hat it is expected to cover.

In mechanical drawing, 8 term-periods* are not too many when it expected to teach a young man to look at a complicated drawing and ive a picture in his mind of the machine, or that he can take a drafts-an's drawing and tell wherein it does not represent the apparatus tended.

In mechanical processes, three term-periods are given in which he is ught how materials from their natural state are made into useful parts apparatus used in the navy.

Principles of mechanism is given three term-periods. The name of is subject will indicate its importance.

Marine engines and boilers are given five term-periods. Under this ading a little theory of the action of steam is taught but it is mostly scriptions of apparatus used. After he finishes this subject he can read description and with the assistance of drawings readily understand any echanism or apparatus that is new to him.

Of secondary value is the fact that while he is learning this "language the material" as it might be called, he is learning the details of the achinery now used in the service.

* A term-period meaning a two-hour period per week for one term.

Five term-periods about half of which is devoted to naval construction and half to engineering mechanics or designing.

Four term-periods are given for experimental engineering, gas engines and turbines, about half the time being spent on experimental engineering.

During the last two years of the course I should say about half the work is descriptive of apparatus or parts of machinery.

What part of this course should be omitted to take up thermodynamics, machine design, precision of measurements or any, more theoretical subject?

Some of the sketches and descriptions might be omitted from marine engines and boilers and more principles might be taught. That is the tendency in this branch now.

If the work done by all other departments should be analyzed carefully, there would come up the same question, what can be omitted?

The range of age limits at entrance is, in the opinion of a large number of officers, too great. Many want to make the entrance age from 16 to 17 inclusive. Why not make it 18 to 19 inclusive and require the education for entrance such as might be expected in a young man of that age, and is required in all colleges for their technical courses?

Require them to be high school graduates or to have pursued an equivalent course and in addition, give them a suitable entrance examination.

By this method a year's work, more or less, in the course as it now is might be omitted and its place could be taken by some of the subjects suggested by the author.

The question brought up, that in this democratic institution, if the entrance requirements are raised, it would not give the boy in certain outlying districts and from country places an equal show with the boy who has had greater advantages.

With the school system so excellently developed in all parts of the country a high school education should be within reach of nearly all who have the energy to go after it. And a larger number of the suitable young men of the country of the ages 18 to 19 inclusive can pass, without previous preparations, the examinations in the more advanced work, than could pass the entrance examinations as they now are.

PROFESSIONAL NOTES.

Prepared by Lieut.-Commander W. B. Wells, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
adavia	28,000	Fore River Shipbl'dg Co.	Building.
eno	28,000	New York "	"

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
etsky	14,500	Trieste.	Under trial.
iyi	14,500	"	Launched April 12, 1910.
herzog Franz Ferdinand.	14,500	"	Under trial.
ibus Unitis	20,000	"	Launched June 24, 1911.
	20,000	"	"
	20,000	"	Authorized.
	20,000	Fiume.	"

'he Austrian battleship *Viribus Unitis* was launched at Trieste on ie 24. The vessel is 493 feet long and 91 feet beam, with a draft 27 feet, the completed displacement being in the neighborhood of oo tons. Three sets of turbines, aggregating 26,000 horse-power, are igned to give a speed of 21 knots. The armament consists of twelve inch guns in four center-line turrets, two being superposed, so that guns bear ahead and astern; twelve 6-inch and eighteen 3.4-inch, five inch torpedo-tubes, are also to be mounted. The maximum thickness the belt is 12 inches, and the total weight of the armor carried is said be 6000 tons.—*United Service.*

CHINA.

A Cruiser for the Training of Chinese Officers.—Messrs. Vickers, mited, launch to-day (Friday) from their Naval Construction Works, rrow-in-Furness, a cruiser named *Ying-Swei,* for the Chinese Navy, the training of officers and men in connection with modern munitions naval warfare, and therefore a forerunner of that new navy which l be built within the next few years for China.

While having all the fighting capacity possible in a ship of the draft feet) and of the limited displacement (2400 tons) prescribed by the inese authorities to meet certain harbor conditions, she excels in the nprehensive character of the provisions introduced for training purses. Messrs. Vickers, Limited, are responsible for the design, which,

like the plans for many of the later warships built by the company, ha been prepared by Mr. T. G. Owens, the naval constructor and a direct of the company. The special features of the design are: (1) The gr variety in the size of the guns fitted—6-inch, 4-inch, 14-pounders, pounders, and 1¼-pounders—all introduced primarily for instructio purposes; but incidentally making the cruiser a formidable fighting sh (2) The different types of boilers on board—cylindrical and water-t —so that the Chinese stokers may acquire experience. (3) The adopt of alternative systems of auxiliary machinery as far as is consistent w efficiency, for the education of Chinese officers and crew. (4) T unusually large quantity of ammunition carried; 160 rounds for each the two 6-inch guns, 200 rounds for each of the four 4-inch guns, 1000 rounds for each of the smaller guns, which permits of exten battle practice, and confers the advantage of the maintenance of a l engagement in war. (5) The embodying of an unusually thick p tective deck—1½ inch—in such a light cruiser. (6) The ensurance o speed of 20 knots under easy steaming conditions and without exac that care and organization in the stokehold which come only with longed experience. The principal dimensions of the ship are as follo

Length between perpendiculars	330 feet.
Breadth, moulded	39 feet 6 inches.
Depth, moulded	23 feet 9 inches.
Mean draft	13 feet.
Displacement (about)	2500 tons.
Speed (about)	20 knots.

The armament consists of two 6-inch quick-firing guns, one carried the forecastle deck, and the other on the poop deck; four 4-inch qu firing guns, placed on the upper deck—two at the aft end of the f castle, and two at the fore end of the poop, at the sides of the ship; 14-pounder quick-firing guns—one on each end of the upper deck ar ships; six 3-pounder quick-firing guns—three carried on each side of upper deck in the waist, and two 1¼-pounder quick-firing guns placed the bridge. Two 18-inch revolving deck torpedo-tubes are carried, one each side of the upper deck aft. The guns and torpedo-tubes are c trolled in accordance with the latest practice. Accomodation is provi for 230 officers and men and 40 cadets.

The propelling machinery is of the Parsons turbine type, with th lines of shafting, and one propeller on each shaft. The turbines arranged in one engine room. The high-pressure ahead turbine is the center shaft, and a low-pressure ahead on each wing shaft. wing shafts are arranged for working astern, a reversing turbine be incorporated in each of the two low-pressure turbine casings.—*Engin*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleship.			
Danton	18,350	Brest.	Under trial.
Mirabeau	18,350	Lorient.	" "
Voltaire	18,350	Bordeaux.	" "
Diderot	18,350	St. Nazaire.	" "
Condorcet	18,350	"	" "
Vergniaud	18,350	La Seyne.	" "
Courbet	23,500	Lorient.	Building.
Jean Bart	23,500	Brest	"
France	23,500	St. Nazaire.	Authorized.
Paris	23,500	La Seyne.	"

TRIALS OF THE FRENCH BATTLESHIP "MIRABEAU."—The French battleship *Mirabeau* has recently completed her official trials, and we give below a summary of the speeds achieved and of the consumption of coal under various conditions. The vessel is fitted with Delaunay-Belleville water-tube boilers, twenty-six in number, having a combined grate area of 145 square meters, and a heating surface of 4787 square meters. Her safety valves are set to blow 18 kilos. per square centimeter, say 256 pounds per square inch. The engines consist of two sets of Parsons type turbines working on four shafts.

Ten Hours Full Speed Trial.

Date	20th June
Number of boilers at work	26
Consumption of coal per mile, contract	967 kilos. = 2131 lb.
" " " " actual	939 kilos. = 2069 lb.
" " " sq. m. of grate per hour	128 kilos. = 282.1 lb.
" " " sq. ft. " "	26.2 lb.
Number of revolutions	321
Mean speed (contract 19.25 knots)	19.73 knots

Six Hours Trial with only Thirteen Boilers at Work

Date	23d June
Consumption of coal per mile, contract	410 kilos. = 904 lb.
" " " " actual	400 kilos. = 882 lb.
" " " sq. m. of grate per hour	40 kilos. = 88.2 lb.
" " " sq. ft. " "	8.2 lb.
Number of revolutions	221
Mean speed	14.53 knots

Twenty-four Hours Trial with all Boiler at Work.

Date	27th and 28th June
Consumption of coal per mile, contract	685 kilos. = 1510 lb.
" " " " actual	667 kilos. = 1470 lb.
" " " sq. m. of grate per hour	84 kilos. = 185 lb.
" " " sq. ft. " "	17.2 lb
Main speed	18.28 knots

Six Hours Consumption Trial with Nine Boilers at Work.

Date	6th July
Consumption of coal per mile, contract	280 kilos. = 617 lb.
" " " " actual	258 kilos. = 569 lb.
" " " sq. m. of grate per hour	19 kilos. = 41.9 lb.
" " " sq. ft. " "	3.89 lb.
Number of revolutions	163
Main speed	10.74 knots

These results were arrived at in spite of the fact that one of the propellers had one of its blades damaged.

THE FRENCH SHIPBUILDING PROGRAM.—The shipbuilding program, proposing the construction of 16 battleships, prepared by Admiral Boué de Lapeyrère, lately French Minister of Marine, has not yet received the effect of law, though, in the first two years, 1910 and 1911, its provisions have been observed by the laying down of the *Jean Bart* and *Courbet* (one of them additional to establishment and the other replacing the *Brennus*), and the *France* and *Paris*, which are to be begun this year, both of them additional. M. Delcassé, the new Minister, intends in the autumn to embody the remainder of the program in a bill to be presented to the Chamber. Admiral de Lapeyrère proposed that the last ship of the series should be laid down in 1919, but this arrangement was much criticised, though it was ruled by financial considerations, and M. Delcassé's object is to anticipate that event by two years, which will make it necessary to lay down four ships instead of two in 1915. The following is the new scheme, showing the ships to be replaced, as intended by Admiral de Lapeyrère: 1912, two ships (*Carnot* and *Charles Martel*); 1913, two ships (one additional, one replacing *Jauréguiberry*); 1914, two ships (*Bouvet* and *Masséna*); 1915, four ships (two additional, two replacing *Charlemagne* and *St. Louis*); 1916, none; 1917, two ships (one additional and one to replace *Gaulois*). The age limit is to be 25

... ships begun before 1906, and 20 years for later ships. It is ... to construct dry docks at Lorient and Sidi Abdallah, Tunis-...

S... OF THE FRENCH DOCKYARDS.—The increasing expenditure ... and the demands for other services, combined with the fact ... M. Delcassé regards the program as a minimum, cause the situation ... dockyards to be questioned with great anxiety. It is recognized ... absurdity to maintain five home dockyards and port establishments ... organized on the same system and with identical organization, while ... two of them are in full activity, and various departments at the ... as the French say, *tournent à vide.* Brest is intended to be ... equipped; the two docks will be completed, the entrance to the Penfeld where the dockyard is, will be widened, and new buildings will be erected at Lanninon, between the Penfeld and Porzic. Toulon will also be maintained in full activity, and there is great reluctance to touch Cherbourg though M. Chautemps, who has reported on the estimates to the Senate would suppress everything there that was not concerned with the flotilla. He would do away with the naval prefectures at Lorient and Rochefort. The importance of the former is considerable, as is shown by the intention to construct new docks there, but Rochefort has lost its value, and has been maintained merely out of consideration for local feeling and interests. It is highly probable that progressive reductions will be introduced there, and that in the end the place will be maintained, with reduced staff, as a secondary arsenal.—*The Engineer.*

FRENCH NATIONAL DEFENCE.—The discussions which have arisen out of the reorganization of the French high command have caused attention to be concentrated on problems of national defence, and several writers have been pointing out the want of co-ordination between the Departments of War and Marine. The staff of each has a small section concerned with the relations with the other, but they are almost wholly occupied in administrative matters, and sometimes contentious affairs. General Langlois has therefore suggested that there should be a staff wholly occupied in the consideration of national defence from the point of view of both services. His idea is that this suggested staff should consist in equal numbers of military and naval officers selected for their fitness for such duties. He hopes that the result might be to establish a permanent link between two services, which have the same object, but which are usually too much engrossed in their own occupations to have time for other concerns. Moreover, there is a certain rivalry or jealousy between them, which is not for the public good. Evidently the professional section of the Superior Council of Defence has attained some results, and the general's plan meets with some measure of approval. So far, however, it has been the subject merely of general discussion, and no administrative change has been made. The new arrangements for the Defence Council seem meantime to be reducing the importance of the permanent section.—*Army and Navy Gazette.*

FOUR-GUN TURRETS.—The French, always daring and enterprising in their experiments, are about to go one better than all the rest of the world, and build battleships to carry four-gun turrets. The twin turret has been with us for nearly half a century, and the triple turret has also come to stay, after a long period of experiment and trial during the present century by our American cousins, and lately, also, by several of the large Continental naval nations, such as Italy, Austria, Russia, and some of the South American Republics. But before Britain has a triple-turret battleship, it is now certain that France will possess a capital ship carrying four guns in a single gun-house. By this means it is intended to keep down the dimensions of the capital ships of the French

ry, and, by placing the turrets on the center line, secure a concentra- of broadside and end-on-fire, never before effected in ships of the nage that France will presently place on the stocks. But four-gun ets have their disadvantages as well as their advantages, for by ing so many eggs in one basket, a large part of a ship's hitting power, unting to something never less than one-third, may be withdrawn m the captain in the height of a closely contested engagement, by a ple, and not altogether uncommon, accident in the turret itself— as a pipe, or wire, going wrong in the machinery for working the s, or training the turret itself. There are so many things inter- endent in the turret-working apparatus that, duplicated as it is, there many chances of a temporary breakdown, and a temporary loss of third of the primary armament in the heat of an action would be ery serious matter. Still, four-gun turrets have advantages as as disadvantages, and there is a lot to be said in their favor.— *ted Service Gazette.*

viation experiments were made at Cherbourg recently with a view to ing the capacity of an aeroplane to discover a submarine. The trials e carried out with two torpedo-boats and two submarines on a day n there was only a slight breeze and a calm sea. In the first case pilot Aubrun was told approximately where the two submarines lay, he, keeping at a height of about 1000 feet to 1200 feet, found them very easily about three miles out. The second test was more diffi- , as no hint was given as to the locality of the submerged ship. run started from the Polygon and described circles after the fashion a hawk, at about the same altitude as before, gradually bearing away ea on the left. As the sun was low and the rays slanting across the er, it was not easy to see the sea bottom, but after a while Auburn iced some flashing reflection from the periscope, and was then quickly to discover the body of the submarine in water of about 20 feet th. The result of the experiments is taken to prove that an aeroplane discover a submarine from a height of over 3000 feet, whereas the scope does not reflect the image of the aeroplane after more than that height. At the same time, it will never be easy to find a sub- ine even by the most practiced pilot, for it is a mere speck in the vast me of the sea.

hese trials will be followed shortly by others, and it is already con- red necessary that, for such scouting, a slow machine that flies about miles an hour is better than the fast scout, which does best service erally when attached to a fleet. The way is open to a whole series new maneuvers, whose program would comprise the search for sub- ines at different depths in calm and rough weather—the search for ting and fixed mines, combined action of aeroplanes, cruisers, and edo-boats, the torpedoing of submarines pointed out by aeroplanes, torpedo-boats, and also by torpedoes launched from the aeroplane lf, etc. From the great activity in the French Army and Navy onautic departments it is evident that aeroplanes are intended, and ected, to play a formidable role in the next war, and the French mean keep the lead they have established in this new branch of scientific fare.—*United Service Gazette.*

he naval forces of France have been reorganized. Instead of there g equal fleets in the Mediterranean and in the Channel, the whole the active forces will be grouped in the Mediterranean, while in the thern waters there will be only a reserve fleet. In ordering this istribution, M. Delcassé, the Minister of Marine, has reverted to the eme which existed before Vice-Admiral Boué de Lapeyrère became ister of Marine in 1909. The original plan of Mediterranean con- tration had been introduced by M. Thomson in 1906, after consulta-

tion with the British Government. Vice-Admiral de Lapeyrère has been appointed commander-in-chief of the rearranged forces, and will have as his flagship the *Danton*, which came to Spithead for the Coronation Review. Five other ships of the same class will form the first battle squadron. They are 18,000-ton ships of an improved *Lord Nelson* type, armed with four 12-inch and twelve 9.4-inch guns, and driven by turbine engines. The second squadron will be commanded by Vice-Admiral Bellue. It will consist of the two ships of the *Patrie* and the four of the *Justice* class, the former having four 12-inch and eighteen 6.5-inch guns, and the latter four 12-inch and ten 7.6-inch. Each of these battle squadrons will have three armored cruisers and six destroyers attached, and there will also be a group of reserve ships for each, based upon Toulon and Brest respectively. The third squadron of six older battleships and three armored cruisers, manned in the reserve with nucleus crews, will also be based on Brest. Destroyer flotillas will be attached to each fleet.—*The Engineer.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Ost-Friesland	19,000	Wilhelmshaven.	Launched Sept. 30, 1909.
Thüringen	19,000	Bremen (Weser Yard).	Under trial.
Helgoland	19,000	Kiel (Howaldt).	Launched Sept. 25, 1909.
Oldenburg	19,000	Danzig (Schichau).	" June 30, 1910.
Kaiser	20,000	Kiel (Kaiserliche W.).	" Mar. 22, 1911.
Frederick the Great.	20,000	Hamburg (Vulkan).	" June 10, 1911.
Ersatz Hagen	20,000	Kiel (Howaldt).	Building.
" Aegir	20,000	Danzig (Schichau).	"
" Odin	21,000?	Germania Works.	"
" K. Friedrich Wilhelm		....	Authorized.
" Weissenburg		....	"
" S		Wilhelmshaven.	"
Armored Cruisers.			
Moltke	21,500?	Hamburg (Blohm and Voss).	Launched April 7, 1910.
Goeben	21,500?	"	" Mar. 30, 1911.
J	21,500?	"	Building.
K		....	Authorized.
Protected Cruisers.			
Breslau	4,500 ?	Stettin (Vulkan).	Launched May 16, 1911.
Magdeburg	4,500 ?	Bremen (Weser).	" May 13, 1911.
Ersatz Cormoran	4,500 ?	Bremen (Weser).	Building.
" Condor	4,500 ?	Wilhelmshaven.	"
" Seeadler	.	....	Authorized.
" Geier	.....	....	"

THE NEW GERMAN WARSHIPS.—The new issue of the German naval annual, *Nauticus*, gives additional particulars concerning the battleships of the 1898 program, the *Oldenburg* of the 1909 program, and the battle cruiser *Moltke*. In regard to the battleships, the facts support generally the statements already made. The armament is analogous in arrangement to that in the *Nassau*, there being twelve 12-inch guns in six double barbettes, and in addition fourteen 5.9-inch quick-firers, being two more than in the *Nassau*, and fourteen 3.4-inch. The dimensions of these ships are 546 feet 4 inches on the water line, with 93 feet 6 inches beam, 27 feet draft, and a displacement of 22,800 tons. With reciprocating engines of 28,000 horse-power, a speed of 20.5 knots is designed. Steam is produced

15 marine boilers, and while the normal coal supply will be 900 tons, maximum will be 3000 tons. The particulars concerning the *Moltke* w that some statements made were incorrect. The length is 613 feet ches, the beam 96 feet 9 inches, and the draft 27 feet, with a dis-cement of 23,000 tons. The armament consists of ten 11-inch guns five double barbettes planned as in the *Von der Tann*, except that in *Moltke* there are two barbettes abaft, of which the one nearest dship will fire over the other. Thus the bow fire is from six of the guns, and the stern fire from eight of them. The secondary arma-nt consists of twelve 5.9-inch guns, and there are also twelve 3.4-inch. s ship has Parsons turbines of 50,000 horse-power, and the designed ed is 25.5 knots. The normal coal supply will be 1000 tons, and the al supply 3100 tons. The *Moltke* will have four torpedo-tubes, and the tleships six. The *Goeben*, of the 1909 program, will have the same eral characteristics.

HE NEW GERMAN BATTLESHIPS.—It would appear from the comments the German Press that the proposals of the German Navy League for ing a different interpretation upon the Navy Law are received gen-lly with disfavor. Meanwhile, it may be interesting to make a note cerning the armament of the new battleships which are now com-ing for service, being the *Ostfriesland*, *Thüringen*, and *Helgoland*. ese ships are to complete their trials in the autumn. They are more verful than their predecessors, and fairly complete details of them uld shortly be made public. It is already known that they carry lve 12-inch guns arranged on the same plan as the 11-inch guns of *Nassau*, that is to say, in six barbettes, of which two on the middle , and two on either side. For secondary armament they will have rteen 5.9-inch quick-firing guns in a central battery. For fore and fire they will have available six 12-inch and four 5.9-inch, while the adside will be eight 12-inch and seven 5.9-inch. The cost of the nament of the *Helgoland* class is 19,000,000 marks as compared with 00,000 marks in the four ships of the *Nassau* class.

HE "FRIEDRICH DER GROSSE."—With the launch of the battleship of name, formerly known as the *Ersatz Heimdall*, which took place at Vulcan Yard, Hamburg, June 10, the thirteenth German so-called *adnought* is in the water, and also the last ship of the program 1909. She carries as her main armament twelve 12-inch guns in barbettes, arranged on the plan of the 11-inch guns of the *Nassaus*. e ship has been about 19 months on the stocks, and is to be completed service in June next year. The ships of the same program are the *lenburg*, launched by Schichau at Dantzig last June, and *Kaiser*, nched at Kiel in March, as well as the battle cruiser *Goeben*, launched last March by Messrs. Blohm & Voss at Hamburg. The last *edrich der Grosse* was a single-screw turret ship launched at Kiel in 4. She had the then respectable displacement of 6770 tons and steamed 14 knots. Her armament comprised four 10.2-inch and two 6.6-inch ech-loaders. The contrast between the two ships is the mark of the rmous progress which has taken place within the intervening time. old *Friedrich der Grosse* disappeared from the lists about the year , after having long served as a harbor hulk. Field-Marshal von der z, who delivered the baptismal oration, said that for her journey g the paths she has chosen Germany needs the strong fleet created he foresight of the Imperial War Lord.—*Army and Navy Gazette*.

he *Rivista Marittima* publishes the following information concerning man ship yards:

) The Krupp yards—a stock company with establishments at Essen, ers, Neuweid, Sayn, Rheinhausen, Friemersheim, Aunen, Magdeburg, nau, and Kiel. The yard at Kiel constructs government ships. It

has four large covered ways. The battleship *Posen* and the cruiser *Cöln* are being built there.

Ordnance and armor are manufactured at Essen which has as branches the Polygons of Meppen and Tangerhütte. On November 1, 1909, as many as 36,288 hands were employed in these establishments.

The Krupp coal mines employ 10,888 hands, the iron mines, 4699, the factories at Rheinhausen, 3723, making a total of 66,363 hands for the Krupp group. In 1909, these plants produced warships to the extent of 26,000 tons.

(b) The Schichau plants at Dantzig and Elbing are under the direction of Herr Ziese, son-in-law and successor of Schichau. The ship yards at Elbing construct torpedo-boats. The battleships *K. Barbarossa*, *Wettin*, *Elsass* and *Schlesien* were built at Dantzig and the large battleship *Ersatz Frithjof* is being built there.

The Schichau yards at Dantzig have four covered ways long enough for the overall length of the *Dreadnought*.

These establishments employ more than 10,000 workmen and produced in 1909 warships to the extent of 6100 tons.

(c) The stock company "Vulcan" of Hamburg builds ships and engines; has ship yards at Bredow near Stettin where the battleships *Brandenburg*, *Weissenburg*, *Preussen* and *Rheinland* were built; employs 9000 workmen; has also a new yard on the Elba where the *Ersatz Heimdall* is being built; contains four large open ways; built in 1909 warships to the extent of 6100 tons.

(d) The Howaldt ship yard at Kiel constructs naval and mechanical material; is building the *Helgoland*, which will be ready by the summer of 1911. Its way has sufficient capacity for the *Dreadnought* type.

(e) The ship yard of Blohn & Voss at Hamburg is the largest in Germany; built the *Kaiser Karl der Grosse*, but specializes in the construction of armored cruisers, having built the *Friedrich Karl*, *York* and *Shamhorst;* is now completing the *Von der Tann*, which will be ready by next summer; launched last month the *Moltke;* the cruiser *H* is now on the ways and work on the cruiser *I* will presently be begun; has five ways for the construction of the largest ships and employs from 5500 to 8000 workmen.

(f) The Weser Company at Bremen has built a number of small cruisers, besides the battleships *Westfalen* and *Thüringen* (more than 18,000 tons; the *Thüringen* is nearly finished); has two large ways and about 4000 hands; produced in 1909, 18,500 tons.

BRAUCHT DEUTSCHLAND EINE SCHLACHTFLOTTE?—"Does Germany need a fighting fleet?" This question was recently raised by a pensioned German Army officer, Capt. Hartwig Schubart, to whose arguments we have already drawn attention. Briefly, they are summed up in the belief that the new fleet withdraws money from the army, and that the number of British *Dreadnoughts* is determined in the German Reichstag. To this officer Capt. Dr. Fritz Roeder replies in the *Neue Militärische Blätter*, of which he is now the editor. The conversion of Germany from a mainly agricultural to a mainly industrial country, depending upon imports to no small degree for her food and raw materials, the growth of commerce and the growth of population, are the reasons for the creation of a great fleet. It must be made impossible to blockade the German coasts, and the defence, based chiefly on Heligoland, must be capable of being converted into an offensive defence. Captain Roeder says it is obvious that the German fleet has no hostile purpose towards Great Britain. His arguments follow closely the line of thought expressed in the preamble of the Navy Law. No fleet must be a menace to the security or prosperity of Germany. Granting freely the need of her fleet to Great Britain, the editor of the *Militärische Blätter* insists that the need to Germany of her fleet is just as great. "Forty years ago we had to reckon only with an The war of the future will demand a settlement by battle both by land

ıy on land, and not to protect possessions worth millions at sea. sea. That is why Germany requires a fighting fleet as well as an ."—*Army and Navy Gazette.*

RSONNEL OF THE GERMAN NAVY.—Coming now to the *personnel* of German fleet, it is interesting to note that simultaneously with the th of the ships of the fleet, the German Admiralty has been careful rovide for the necessary increase in the numbers of officers and men ıan them. For the last few years something like over 3000 officers men have been added annually.

ıe numbers of the officers of different ranks on the active list of the last year were: 4 admirals, 8 vice-admirals, 19 rear-admirals, 84 ains, 199 frigate- or corvette-captains, 461 captain-lieutenants, 1055 enants, 398 midshipmen, and 185 naval cadets. This showed an inse over 1909 of 2 rear-admirals, 4 captains, 10 frigate- or corvetteains, 27 captain-lieutenants, and 52 lieutenants.

ıe staff of the marine battalions was as follows: 1 colonel, 2 lion commanders, 11 captains, and 36 first and second lieutenants. marine field-artillery have 2 captains, 2 first-lieutenants, and 4 enants, and the pioneer detachment, 1 major, 2 captains, and 1 firstenant.

ıe engineering department consisted of 12 chief engineers and senior engineers, 75 staff engineers, 119 senior engineers, and 192 engineers, an increase of 35 over the numbers of the previous year.

ıe medical department consisted of 1 medical director-general, who s with a rear-admiral, 4 inspector-generals, 64 senior staff surgeons, aff surgeons, and 113 surgeons and assistant-surgeons, being an inse of 15 over the numbers of 1909.

the accountant department were 43 staff-paymasters and 173 payers, an increase of 9 over previous year.

ıe seamen's, boys', dockyard and torpedo divisions numbered as ws:

4 chief warrant officers, 1249 warrant officers, 8 bandmasters, 216 petty officers, 3815 first-class petty officers, 5723 second-class petty ers, 8364 leading seamen, 25,092 seamen and stokers, 96 boys' petty ers, 1554 boys.

hese were distributed among the different divisions in accordance the following table:

	Chief Warrant Officers.	Warrant Officers.	Bandmasters.	Chief Petty Officers.	1st Class Petty Officers.	2d Class Petty Officers.	Leading Seamen.	Seamen.	Petty Officers for Boys.	Boys.	Total.
ıen's Divisions..	158	236	8	118	1,436	1,931	4,139	12,417	....	....	20,443
' Division	....	....	....	....	....	....	....	....	96	1,554	1,650
yard Divisions:											
ne-room Personnel	344	690	....	....	1,418	2,120	2,148	6,447	....	....	13,162
r Ratings........	40	81	....	2	385	577	431	1,292	....	....	2,808
pedo Divisions:											
ıan Personnel....	25	49	..	36	206	309	700	2,099	....	....	3,424
ne room Personnel...............	97	193	....	....	465	696	948	2,837	....	....	5,236
Total 1910........	664	1,249	8	216	3,815	5,723	8,364	25,092	96	1,554	46,781
In 1909...........	629	1,182	....	207	3,583	5,374	7,810	23,428	96	1,554	43,871
Increase 1910 ...	35	67	8	9	232	349	554	1,664	....	....	2,910

There was an increase over 1909 of: 35 chief warrant officers, 67 warrant officers, 9 chief petty officers, 232 first-class petty officers, 349 second-class petty officers, 554 leading seamen, 1664 seamen, etc., showing a total increase of 2910.

The seamen artillery divisions and mining detachment numbered 30 chief warrant officers, 61 warrant officers, 3 bandmasters, and 3892 petty officers and men, of whom 15 chief warrant officers, 30 warrant officers, and 800 petty officers and men belonged to the mining detachment. There was an increase of 3 chief warrant officers, 7 warrant officers, and 283 petty officers and men over the previous year.

The marine infantry numbered 199 non-commissioned officers and 982 men. The sick bay staff consisted of 574 petty officers and men of various grades, and there were 380 ships' stewards, writers and assistants. The sum total of all ranks was 57,170, being an increase of 3431 over the number for 1909.

Personnel.	Officers.	Doctors.	Non-Commissioned Officers and Seamen.				Total all Ranks, 1910.	Increase compared with 1909.
			Warrant Officers.	Petty Officers.	Seamen.	Boys.		
Naval Officers	1.872	....	....	....	....	....	1,873	94
Junior Executive Officers	....	..	....	398	185	....	583	...
Engineer Officers	401	...	....	....	....		401	35
Seamen, Boys, Dockyard, and Torpedo Divisions	...	....	1.913	9,762	33,456	1,650	46,781	2,910
Seamen Artillery	....	....	91	549	3,346	....	3,986	293
Marine Infantry	50	....	..	210	1,153	....	1,413	[illegible]
Personnel of the Clothing Department	2	....	....	27	150	....	179	[illegible]
Medical Department	....	273	....	244	330	....	847	47
Artillery Administration	93	....	127	68	....	....	288	11
Torpedo *Personnel* (Technical and Administrative)	61	....	145	59	....	....	265	13
Mining *Personnel* (Technical and Administrative)	30	....	46	71	....	....	147	8
Accountant Department	...	....	91	239	50	....	380	17
Surveying Department			28	....	....	....	28	...
Total	2,509	273	2,441	11.618	38,679	1,650	57,170	3,431
	$\underbrace{\qquad}_{2,782}$		$\underbrace{\qquad}_{54,388}$					

From the "Etat für die Verwaltung der Kaiserlichen Marine auf das Rechnungsjahr, 1910."

There are two so-called *marine inspektions*, one at Kiel and one at Wilhelmshaven. Each is under a rear-admiral, as inspector. Included in these *inspektions* are the seamen and dockyard divisions, each of which are commanded by a captain. The seamen's division are divided into battalions; the so-called dockyard divisions consist in the main of the engine room and stoker *personnel*. In the torpedo divisions are included both the seamen and engineering *personnel*.

The educational and training department is under a vice-admiral, who has supervision over all the sea-going and shore establishments; his headquarters are at Kiel. There are four sea-going cadet and boy training ships, which make foreign cruises during the winter, returning in the spring; new batches of cadets and boys being embarked each October. The present sea-going training ships are the large cruisers *Freya*, *Hertha*, *Victoria Louisa* and *Hansa*. The Naval Academy, which is at Kiel, has a rear-admiral for its director, and is the superior school for the navy, its courses being attended by commissioned officers. The naval school for cadets is also at Kiel, its director being a captain. The school for

gineers and warrant officers is at Wilhelmshaven, and the training ship seamen is at Kiel.

Naval cadets are selected once a year—in April, the day of selection ng fixed by the inspector of naval instruction, to whom the names of ndidates must be sent in for approval, together with the required tificates, between August 1 and the 1st of the following February. ndidates must pass an entrance examination if they only possess a tificate showing that they are fit to be in the first class (6th form) a German *gymnasium*, a *real-gymnasium*, or a Prussian *Ober-real-ule*. Candidates, however, who have obtained a "leaving certificate" m one of the above-named schools are accepted without entrance amination, as are also cadets from a military cadet corps school, on senting a certificate that they have passed the army ensign examina-n. All candidates must have received the predicate "good" for glish. The age limit is from 17 to 19. The names of candidates are mitted for approval to a committee of three or more naval officers pointed by the inspector of naval instruction. The whole period of ning lasts some three and a half years, at the end of which time ir names are sent in for election as officers of the Imperial Navy.

The men for the navy are drawn for service as for the army. Of the nual contingents, one-third belong to the seafaring or semi-seafaring pulation of the Empire, and two-thirds are landsmen. For the navy service is divided as follows:

Active service (beginning with 20th year)	3 years.
Naval reserve	4 years.
Seewehr (corresponding to the *Landwehr* in the army)—	
First levy	5 years.
Second	7 years.

There are in addition the Naval Ersatz Reserve, which is composed of n of the seafaring population, and also a *Landsturm* as in the army, ich includes all those not drawn for the navy from the 17th to the 45th r.

Volunteers are also taken for three, four, five and six years; and boys ween the ages of fourteen and a half and eighteen, who join for long vice and are trained to become warrant or petty officers, and leading man. These boys form the ships' boys' division (*Schiffsjungendivision*), l about 600 are entered at the beginning of April of each year at edrichsort, where the school is, near Kiel. Boys desirous of joining ships' boys' division must apply in person between May 1 and February o the commander of their *Landwehr* district, or to the commander of division of Friedrichsort. These boys are sent to sea for cruises in seagoing training ships as the cadets are. They are required to serve nine years, but can remain on for longer.

The gunnery training establishment (*Inspektion der Schiffsartillerie*) fixed at Sonderburg, on the Schleswig-Holstein coast to the north of il. The inspector is a rear-admiral. Attached to the shore establish-nt are the seagoing training ships, consisting of the battleship *Schwaben*, armored cruiser *Prinz Heinrich*, with the small cruisers *Undine*, *ttgart*, *Danzig*, and for experimental purposes, the armored cruiser *nz Adalbert*. The artillery school on shore is in charge of a captain. coast artillery and mining establishments (*Inspektion der Küsten-llerie und des Minenwesens*) is located at Cuxhaven. The inspector is ear-admiral. For mining instructional purposes there are attached the cial service ships *Pelikan*, *Nautilus* and *Rhein*.

t has to be admitted that simultaneously with its growth, the German vy has made giant strides in its efficiency. Nowhere is this efficiency re displayed than in their torpedo service, the handling of German troyers and torpedo-boats under all circumstances of wind and weather ves little to be desired and reflects the greatest credit on officers and n.

the 19th of the same month of the current year, just two years from date of her commencement.

A beginning was made with the construction of the new battleship *King orge V*—to be built at Portsmouth—on January 16, and it is hoped she l be ready for launching next September. She will be 564 feet in gth, with a beam of 90 feet, have an engine power of 31,000 horse, ich is to give her a speed of 21 knots. A large quantity of material is eady prepared for her construction, and she is now making excellent gress. The battleship *Orion*, also built at Portsmouth and launched t August, is being well advanced towards readiness for trial, all her pelling machinery being fitted in its place on board and ready for am.

The cruiser *Blonde* (sister ship to the *Blanche*), built at Pembroke ckyard, underwent her steam trials in a very satisfactory manner early March, after which she returned to the dockyard to be completed dy for commission. The cruiser *Active*—of the *Blonde* type—whose nch was fixed for February 27, was not put into the water until March at which date all the principal fittings of the after part of the vessel re completed, with the exception of the propellers, which are to be pped when the vessel is in dock. Her turbine propelling machinery is y now being put on board, and her trials are not expected to take place il October. The cruiser *Amphion*, a replica of the *Active*, was laid wn on March 15, when work was at once proceeded with; very satis- tory progress has been made with her, and she is expected to be nched in October.

The *Lion* is making rapid progress at Devonport Dockyard, the under- ter work is completed and work in the engine and boiler rooms well vanced and ready for the powerful turbines with which the vessel is be fitted. The three great funnels and the twin rudders are in position, placing of the latter having been the heaviest job of the kind ever omplished at the dockyard, as each rudder weighed many tons. The w battleship *Centurion*, which had her keel plate laid on the slip— ely occupied by the *Lion*—on January 16, is having her construction vanced at a rapid rate, material having been previously collected so t the progress of work should not be hindered. The vessel will be feet long, with a beam of 89 feet, and a displacement of about 24,000 s. By May material to about half her launching weight had been built o her hull, so that she may probably be ready to take the water in ptember next.

Turning now to the progress made in England during the past six nths by our private shipbuilders of warships and makers of their chinery, we note that the cruiser *Weymouth*, built by Sir W. G. Arm- ong, Whitworth & Co., at the Elswick shipyard, and launched last vember, is now ready for her trials. The super-*Dreadnought Monarch* o for the British Government, was launched on March 30, and her pro- lling machinery is now practically all on board. A training cruiser the Chinese Government, which was laid down early in the year, is w completely plated, and will be launched in September. Work on e Brazilian battleship *Rio de Janerio* has been suspended for some nths, but substantial progress will be made in the near future.

During the past half year Hawthorn, Leslie & Co., Limited, have sub- tted for trial three 27-knot destroyers, the *Nemesis, Nereide* and *ymphe*, built at their Hebburn shipyard, and all have been accepted by e Admiralty—the *Nemesis* on March 7, the *Nereide* on April 6, and the *ymphe* on May 18. With reference to the building of these vessels, it to be noted that notwithstanding a 13 weeks' stoppage of work in the ipyard due to labor troubles the contract delivery date—April 13, 1911— r all three ships was only exceeded in the case of the *Nymphe*. The llers for the cruiser *Weymouth*, made at Hawthorn's have been steamed "moorings," but the official trials have not yet taken place, the main

contract for her machinery being with the Parsons Marine Steam Turbine Company. The boilers, uptakes, and funnels of the battleship *Monarch,* also made at Hawthorn's works, were all fitted on board previous to the vessel's launch on March 30, this being the first occasion on which a battleship has been put afloat with all superstructures, such as funnels, etc., already erected in place. The turbines for the vessel being also on board, it is anticipated that the steam trials will take place in October. The boilers of the *Active*—sister ship to the *Blanche*—are now fitted on board, and the turbines for her are now being forwarded from St. Peter's to the ship. The boilers also of the 27-knot destroyers *Jackal* and *Tigress,* building at the Hebburn shipyard, are quite finished, and preparations for testing the turbines for them are being made in the shop. The boilers for the Chinese cruiser building at Elswick—a combination of the Yarrow and cylindrical types, made at Haythorn's, are quite finished and ready to be put on board, while the Parsons turbine machinery of 6500 shaft horse-power—constructed at the same works—is well advanced in the shops, so that the vessel will, in all probability, be put into the water in a couple of months. The machinery and boilers of the new battleship *Centurion*—now building at Devonport—are also well forward in Hawthorn's workshops. The boiler installation for the new cruiser *Amphion*—under construction at Pembroke—an exact repeat of that being fitted in the *Active,* has been ordered of Hawthorn's, the contract for the machinery of the vessel having been placed with the Parsons Marine Steam Turbine Company.

Very good results having been obtained on the preliminary official trials of the battleship *Hercules,* built and engined by Palmer's Shipbuilding and Iron Company, of Jarrow, during the full-power trial on February 28, a speed of 21.5 knots an hour was easily attained, the turbine engines making 335 revolutions a minute, giving a shaft horse-power of [illegible]. The *Hercules* is Palmer's first turbine-driven battleship, and both the Parsons turbines and the large tube Yarrow boilers supplying the steam were built at Jarrow. The ship after the trials returned to the Tyne to complete, and subsequently—on June 16—arrived at Sheerness from the builders, ready for commissioning. The keel of the battleship *Queen Mary* was laid at Jarrow on March 6; she will have an overall length of about 725 feet, with a beam of 87 feet and at her designed water draft a displacement of about 27,000 tons. Her turbine machinery is to drive four shafts, and will give her a speed of not less than 28 knots. On the full-power trial a shaft horse-power of 75,000 may be expected. Steam is to be supplied to the engines by 42 water-tube boilers, so that the propelling machinery as a whole will represent the largest horse-power ever put into a steamship, whether naval or mercantile.

Yarrow & Co., Limited, of Scotstoun, have since the beginning of the current year completed and delivered the twelve of their type of water-tube boilers fitted with their superheaters constructed for the cruiser *Yarmouth.* The two torpedo-boat destroyers *Archer* and *Attack* are still under construction, and have not yet been launched. The torpedo-boat for the Danish Government is practically finished, and will be running her trials shortly. The machinery for the torpedo-boat destroyer, which the Portuguese Government is building in Lisbon, is still in hand in the shops. The triple-screw motor-boat, 60 feet long by 9 feet beam, built for service in Buenos Aires, has been launched, and will shortly be tried, and the two twin-screw motor-boats for the governor-general of Bagdad, together with a shallow-draft launch, 75 feet long by 11 feet 6 inches beam, for a foreign power, have been completed and delivered. Since the end of last December Yarrow & Co. have received an order from the British Admiralty for three destroyers. These vessels are 255 feet long by 25 feet 7 inches beam, and will be propelled by twin-screws driven by Parsons turbine, steam being supplied by three Yarrow water-tube boilers of the latest type.

nycroft & Co., Limited, of the Woolston Works, Southampton, the end of last December completed and delivered the four *Larne*, *Lyra*, *Martin* and *Minstrel*, built by them. All these a length of 240 feet, a beam of 25 feet 3 inches, a water draft inches, and a displacement of 780 tons. They are all triple- propelled by turbine engines of 13,580 horse-power, which in the *Larne* and *Lyra* give a speed of 28.72 and 28.88 knots, and the *Martin* and *Minstrel* 29.32 and 29.62 knots respectively. now in hand at the Woolston shipyard two other vessels of ype, but only twin-screws, the *Acheron* and *Ariel*, but of reased dimensions, each being 251 feet 9 inches long and 26 es beam, with a draft of 9 feet 3 inches, and 800 tons dis- their twin-screw turbines are of 15,500 horse-power, and will speed of 29 knots. The *Acheron* has just been launched.

Laird & Co., of Birkenhead, now that the lock-out of the ship- rs is at an end, report progress since in warship work as The destroyers in hand for the British Admiralty are pro- isfactorily. The turbine propelling machinery for the cruiser been completed, and the vessel, as was stated elsewhere, has her trials. The first two of the four torpedo-boat destroyers e Argentine Government are undergoing trials, and the other l advanced. Satisfactory progress is being made with the hull ery of the lately ordered battleship *Audacious* for the British t, also that of the cruiser *Melbourne* for the same power.

yard and engine works of Vickers, Limited, at Barrow, are as they well can be. The big ship, the *Princess Royal* battle- uccessfully launched on April 29. Being a sister ship to the at Devonport, she has a length overall of 700 feet, a beam of iches, and a draft of 27½ feet, at which immersion she will 00 tons. She is fitted with turbines of Parsons type, of 70,000 r, which are expected to give her a speed of fully 28 knots. of being able to deliver the vessel next May, a strenuous ng made by her builders, who have quite an army of workers her construction. The protected cruiser *Dartmouth*, built firm, and launched on February 14, is 430 feet between per- 49 feet beam, and 55,000 tons displacement, at a draft of Her Parsons turbines are to drive four shafts, the expected e vessel being at least 25 knots. The ship has a continuous om, sub-divided for the storage of oil fuel, and her protective extends the full length of the vessel, covers completely her boilers, magazines, and all vital parts. The naval airship— been very much discussed of late—was successfully launched on May 22. She is 512 feet in length overall, with an extreme her flat sides—of 48 feet. The lifting power is full 21 tons, propelled by two eight-cylinder motor engines, which, when is under way, make 500 revolutions a minute. She has been float on water or to fly in the air, and thus differs from any iously built as this one has been, for army or navy purposes.

ress in warship work effected since the end of last December yard of the Thames Ironworks Company at Canning Town, ine factory at Greenwich, is as follows: The 27-knot de- *utilus*, built and engined by the firm, has passed through her s and attained a speed of 27 knots on "the mile" run at The progress made on the *Thunderer* battleship since her February 1 has been very rapid, all the main machinery and ng been put in place since the vessel was berthed at Dagen- engine works of the company at Greenwich are now busily the propelling machinery of the "second-class cruiser" ow building at Chatham dockyard. This vessel is 453 feet l, has a beam of 49 feet, a draft of 16 feet, and a displace-

ment of 4820 tons. Her propelling machinery consists of Parsons turbines driving four shafts, one high-pressure ahead and one astern on the wing shafts, and one low-pressure ahead and one astern on each center shaft. Twelve water-tube boilers of Yarrow type, in three stokeholds, supply steam; the machinery develops 25,000 shaft horse-power, and gives a speed of about 27 knots. There is also under construction at the company's shipyard at Canning Town a steam launch for the colonial vessel *Australia*, the propelling engines of which are on the Werry principle, the invention of an Australian resident. They are of the horizontal compound twin-screw type, and consist of one high and one low-pressure cylinder, each fitted with two pistons, with steam inlet at the center and at each end of the cylinders. The center inlet is common to both pistons, and drives them in opposite directions, the return stroke being effected by admission of steam to both end ports simultaneously. Alternative admission and exhaustion is effected in the usual way by means of slide valves. Each piston in one cylinder drives, by means of the usual connecting rod, a crank shaft on the opposite side of the vessel, whose revolutions are kept in unison by means of a cross-coupling shaft and geared wheels.

The Parsons Marine Steam Turbine Company, of Wallsend-on-Tyne, has in hand the machinery for two special class destroyers, the *Badger* and *Beaver*; also that for the battleship *King George V*, under construction at Portsmouth, and for the cruiser *Amphion*, building at Pembroke, but the particulars of this machinery are not at present available.—*The Engineer*.

PROTECTED CRUISER CONSTRUCTION.—The announcement that the *Falmouth* has finished her trials successfully draws attention to the progress made with the construction of these later vessels of the city class. The *Falmouth* is the first of the four authorized in 1909-1910 to be ready for her steam trials. She was laid down on February 21, 1910, and has therefore been nearly sixteen months under construction. The *Dartmouth*, of the same program, was laid down two days previous to the *Falmouth*, and the *Weymouth* and *Yarmouth* in January, 1910, so that once again it is shown that it is not always the first vessel to be laid down or launched that is the first to be ready for sea. The rate of progress made with the *Falmouth*, however, does not compare any too favorably with that of the five original cruisers of the city class. The *Bristol* and her sister ships were laid down from one to two months later in the year than the four *Dartmouths*, yet by June, 1910, three of them had completed all their trials. From the date of laying down to the date of commissioning, these five vessels occupied on an average eighteen and a half months, the *Newcastle* being built in seventeen months, and the *Bristol*, fitted with a new type of turbine, in twenty-one months. As we have shown, the four ships of the *Dartmouth* type have already been in hand for sixteen months or more, and only one has actually reached the trial stage. For the four ships to be completed and commissioned in the same average time as their five predecessors, they ought all to be quite finished by the end of August. It is significant that the four *Dartmouths* occupied a comparatively longer time on the stocks than the vessels of the first batch, the average time from the date of laying down to the date of launch being eleven as compared with seven and a half months. Date of launch alone is not, as Mr. McKenna said, a decisive test of a vessel's progress, but when a whole class takes about half as long again to build and launch as a preceding class of similar design, the fact is worthy of note. Has the heavy armored ship programme of 1909-1910 anything to do with this apparently slower rate of construction of the cruising ships?—*Army and Navy Gazette*.

OUT CRUISER "DARTMOUTH."—The scout cruiser *Dartmouth*, built by rs. Vickers, Ltd., has completed her trials, which proved highly sucul. The new vessel is a protected cruiser 430 feet long, of 5250 tons acement, and carrying eight 6-inch breech-loading guns. She is prod by Parsons turbines developing 22,000 shaft horse-power. This r was easily gained without pressing the boilers, and she steamed st 26 knots. Her designed speed was 24¼ knots. The fuel contion was well under 1½ pound per shaft horse-power per hour.—'s *Weekly*.

e battleship *Hercules*, launched from Messrs. Palmer's yard, Jarrow, ay last year, has been completed in advance of her contract time, delivered to the Admiralty. The *Hercules* will not, however, take in the forthcoming naval review, but, after running 24 hours acnce trials, will proceed to Sheerness and then to Portsmouth, where, taking in stores, she will be commissioned on July 16.—*Page's kly*.

OOTH WORKING OF NUCLEUS CREW SYSTEM.—Much gratification has felt and expressed in naval circles at the extraordinarily smooth ner in which the nucleus crew ships were this year mobilized and bilized. The old fuss and furore to get ships' complements on d, and the ships away to sea, has been gradually decreasing since the duction of the, at first, much-abused Fisher system of nucleus crews. previously had skeleton and nucleus crew systems on paper, but they not to be compared with the present system which the drafting auties at the three great naval ports—Portsmouth, Devonport and Chat—have now got into such smooth running order. Not many years ago columns of the daily press were full of luminous, and sometimes ully inaccurate, description of the movements of bluejackets and nes on the day that the vessels of the old fleet reserve were mobifor summer maneuvers. To-day even more vessels have their crews ght up to the authorized standard, and are sent to sea for exercises maneuvers with so little bustle that scarce a note of comment ars in the press, except, perhaps, a short wire to say the thing been done. But apart from the spectacular point of view, naval men w how much more efficient and ready for battle are the ships that are raised from nucleus crews to the standard complement, than were e turned out from the old-time fleet reserve, with their machinery their guns in anything but working order, and their crews needing a month to get themselves and their weapons into fighting trim.—*ed Service Gazette*.

EMOCRACY AND THE OFFICER QUESTION.—Speaking at Oxford recently, Secretary of State for War said "that the German democracy would btless follow its rulers to war, as would in all probability the democof England, but both democracies were more and more influencing policy of their rulers." This is also our view, and we sincerely hope the fact will be kept prominently before that section of the rulers who charged with the upkeep of the British Army and Navy, and that bean economic power that is every day growing stronger creeps on and whelms them in their lethargy, they will take steps to ensure that levelling up of the officer question is attended to. The democracy of land will follow its *leaders* undoubtedly, but it cannot follow them has not got them. There should be no confusing of the term *ruler* *leader* in the military sense, and it should be remembered that war is ntially a military operation, and that hitherto economic measures have wed on that operation only. The aristocracy in England to-day are sing to work the military machine on the lines that it was worked n there was no democratic strength in the land, and undoubtedly the

o the first destroyer to be fitted with a two-shaft arrangement of
e machinery. Messrs. Thornycroft have a sister vessel, H. M. S.
on the stocks, which is also in a forward state of completion and
e ready for launching very shortly.

aking at Birmingham a few days ago Sir Joseph Ward said he was that his ideals of an Imperial Parliament had not been accepted e conference. He was not surprised, however, because it was a r on which public opinion had to be educated, and certainly the inions opinion was tending in that direction. Under such a scheme Dominions would be able to contribute their share towards the naval ice of the Empire. His country was now paying nine shillings a ; another was only paying four shillings, but if a uniform payment n shillings could be fixed, the Dominions would be paying their fair towards supporting the navy. Fifty more *Dreadnoughts* could be laid down to-morrow without costing the ratepayers of the Mother try another penny. He was no Jingo, but such a navy would be the est guarantee for the world's peace that could be conceived.—*Page's ly.*

M. BATTLESHIP "HERCULES."—Palmers' Shipbuilding and Iron Com- Limited, Jarrow-on-Tyne, are to be congratulated on the success- ompletion of the *Hercules*, which has passed through her final ac- nce trial, and was handed over to the Admiralty June 15, a fort- before the contract date of completion, July 1 of this year. This rmance is the more remarkable as the vessel is the largest yet l to the British fleet, and as operations were considerably hindered g the progress of the work, owing to labor troubles extending over months; it is also indicative of the satisfactory character of acilities at the builders' works, and of the organization of the staff Mr. A. B. Gowan. Another feature of note is that the ship has twice in the dry dock at Hebburn-on-Tyne, now controlled by the ers' Company, a fact which shows that its dimensions suffice for odern battleship under normal conditions of loading. The *Hercules* length of 510 feet, with a beam of 85 feet, and on a draft of 27 he displacement is almost exactly 20,000 tons. Yarrow boilers have fitted, and the Parsons turbine installation has the usual arrangement ur shafts and four propellers. On her final steaming trials, as re- d, the vessel developed 28,700 shaft horse-power, and the speed was 21½ knots. There are ten 12-inch guns mounted in pairs in five ttes, and so disposed that all may fire on either broadside; because, ugh the two barbettes in the center of the ship are placed on the , they are in *échelon*, and the deck erections have been disposed to e them to fire on either broadside with very satisfactory arc of ng forward and abaft each beam. The disposition of the sixteen 1 guns is so that many of them are fairly well protected. The l has a main water-line belt of 11 inches, and over this a further e of 8 inches, while the barbettes are of 11-inch armor, and the gun- s are also 11 inches in thickness. Forward there is additional pro- n above the main strakes. The thickness, however, is reduced rd and aft, first to 4 inches, then to 3 inches, and ultimately to nches. It may be added that the *Hercules* is the eleventh battleship ructed by the Palmers' Company, the immediately preceding ship the *Lord Nelson*, completed in 1908. At present the firm have on the armored cruiser *Queen Mary*.

w SHIPS.—Mr. Burgoyne asked on the 31st ult., whether provisional had yet been fixed for the launch of the capital ships *King George nturion, Audacious, Ajax*, and *Queen Mary*.

Kenna: The actual dates have not yet been fixed, but it is ex- d that the ships will be launched in the following months: *King*

George V, October, 1911; *Centurion*, November, 1911; *Ajax*, December, 1911; *Audacious*, January, 1912; *Queen Mary*, February, 1912.

Mr. Falle: Is the *Queen Mary* called after the Queen Mary of history, in which case the nickname of the sailors on board that ship is easy to guess, or is it called after the gracious Consort of his present Majesty?

The Deputy-Speaker: The question does not arise.

THE SPEED OF DESTROYERS.—The decision of the Admiralty to increase the designed speed of some of the boats of the 1910-1911 program will not create any surprise. In view of the speed of the last few German destroyer programs, especially those which are turbine-driven, such a step was but natural. In his paper on turbines at the recent meeting of the Institution of Naval Architects, Sir Charles Parsons reminded the members that the marine turbine was first introduced into a German destroyer towards the end of 1902, when the S 125 was ordered to be fitted with it. Soon after this boat was completed, another new destroyer, G 137, having double the engine power of the S 125, was fitted with turbines designed for 30 knots, although 33.08 knots was attained on a three hours' run. Since then every destroyer has been turbine-driven, and the German Admiralty have adopted other types besides the Parsons turbine, especially those of German design. Although the designed speed remained at 30 knots, several of the boats in the 1907-1908 and 1908-1909 programs reached between 33 and 34 knots on trial. In the twelve boats authorized in 1909-1910, the designed speed was increased to 32.5 knots. The speed provided for in British destroyers during this same period has varied in the opposite direction, the *Tribal* class, the last of which were authorized in 1907-1908, and which were designed for 33 knots, being followed by the *Beagle* class, designed for 27 knots, and by the *Acorn* class, with the same designed speed. A designed speed of 27 knots is also provided for in the fourteen destroyers of last year's program designed by Sir Philip Watts, but the remaining seven will have higher speeds. The *Archer* and *Attack*, designed by Yarrow, will have a speed of 28 knots; the *Acheron* and *Ariel*, by Thornycroft, 29 knots; the *Badger* and *Beaver*, by Parsons, 30 knots; and the *Firedrake*, *Lurcher* and *Oak*, also designed by Yarrow, 32 knots. It will be seen, therefore, that we are still somewhat behind the German boats in the matter of speed, providing, of course, that the trial conditions are the same in both cases. It would also appear, from the recent appearance of the second destroyer flotilla, that there are occasions when it is inexpedient to drive the boats at the full speed given them. It would be interesting, in view of what happened to the *Acorn* class boats, to learn why there is such a great difference in the trial conditions of the British destroyers, as it has always been said that what was relinquished in speed in the *Acorn* type was compensated for by seagoing qualities.—*Army and Navy Gazette*.

AEROPLANES FOR THE NAVY.—All naval men will appreciate the patriotic action of Mr. Barber in presenting the government with four Valkyrie monoplanes with a view to encouraging aviation in the services. It is hoped that two of these machines will be allotted to the navy, as they are fitted with combination floats and wheels to allow them to rise from and descend upon either land or water, and are, therefore, specially adapted for use afloat. At last, therefore, the navy may have an opportunity, even though in a small way, of testing the value and uses of the aeroplane on machines of its own. We have constantly advocated such a condition of things believing that, notwithstanding the decision of the advisory committee on aeronautics two years ago—by which the army was allowed to experiment with the aeroplane as well as the non-rigid airship, and the navy only the airship of the rigid type—naval officers should be given the opportunity of determining for themselves to what extent the heavier-than-air machine could be of assistance to them in their profession. There are two reasons why this should be done, first, because the officers

ed for training in aviation at Eastchurch have shown themselves to pass the necessary tests in order to qualify themselves for pilots' icates; and secondly, because naval opinion in many countries in- to the belief that, equally with the airship, the aeroplane will be of for scouting purposes. Up to the present the naval airship at ow had not been seen in flight, though Mr. McKenna last week was ine about an early appearance. But the aeroplane has developed ly during the two years it has been under construction, as recent s show. No fewer than eleven competitors in the great race known e European Aviation Circuit succeeded in crossing the Channel.—*y and Navy Gazette.*

IE NAVAL AIRSHIP.—Mr. Burgoyne asked on the 31st ult., why the l airship *Mayfly* had been rehoused without flight, and when it was cted she would really be available for effective service.

r. McKenna: The naval airship No. 1 was taken out of the shed in r to carry out certain experiments which could not be done inside. ship will not be ready for service until she has been accepted from contractors.

r. Burgoyne: In view of all the circumstances, will the right hon- le gentleman consider the advisability of changing her name from *fly* to *Might-Have-Flown?*

r. McKenna: Both names are the invention of the honorable gentle-

IE NAVAL AIRSHIP.—In reply to a question asked in the House of mons recently it was stated that the naval airship at Barrow would eady for her trials at the end of July, but there seems every reason elieve that it will be some time in August before she again emerges her shed. Various alterations are being made in the airship with the of making her as efficient as possible when her trials, which are to xhaustive, take place. Much interest is centered in the ship and in possibilities of her success. Her designers are sanguine she will eve all they claim for her. The problem has been solved that she float safely, which means that she can land safely on water wherever captain may wish to alight. It is probable that even army airships have to be provided with reservoirs in which to alight so as to ent accidents which have frequently happened when they have ted on land. However, the Barrow airship is regarded much as an riment, but her designers and builders are so sanguine of her success they believe she will be the beginning of a fleet of airships to be in connection with the navy. The Vickers' firm have had great rience in the building of this ship, which will be valuable in the e.—*The Marine Engineer and Naval Architect.*

NEW CONNING-TOWER.—The position of the conning-tower in our battleships has for a long time been looked upon by naval officers aving been made obsolete by various innovations in warship building g the last few years, but chiefly by the new method of mounting primary guns. The blast from these weapons has become something than inconvenient to all whose duty would, in action, expose them s stunning effects. The all-round slit between its roof and sides h formed the outlook through which the captain fought and the gator navigated the ship, is large enough to cause inconvenience blast, and still more inconvenience from the shell fire of an y who was able to shoot straight and rely on his fuses to ex- e his shell. For the first time we are to have, in the battleship- er *Lion*, a conning-tower so designed as to protect the officers who inside, from either of the above dangers, and yet arranged on a that will give a good all-around view to those whose important

tc., 100,000 tons per annum; and for marine engines, 80,000 in-
ent horse-power per annum.
ers' Shipbuilding and Iron Company, Jarrow.—Shipbuilders and
of marine engines. Six building slips. Area of works, 100 acres,
ing 8000 men. Warship output for 1909, 1620 tons (British).
ships in hand: *Hercules*, battleship; *Viking*, destroyer.
ield Shipbuilding and Engineering Company, Govan.—Shipbuilders
akers of marine engines. Area of works, 85 acres. Warship out-
r 1909, 5720 tons (British). British ships in hand: *Glasgow*,
; *Grasshopper, Mosquito, Scorpion*, destroyers. Machinery in hand,
llona, cruiser (completed). Two Colonial destroyers are also in

s' Shipbuilding and Engineering Company, Greenock.—Shipbuilders
akers of marine engines. Ten building slips. Area of works, 40
Warship output for 1909, nil. Ship in hand *Colussus*, battleship.
ery in hand, for *St. Vincent*, battleship (completed).
rs. Cammell, Laird & Co., Birkenhead, Grimesthorpe and Sheffield.
builders, armor-plate and projectile manufacturers; makers of
engines, constructors of floating docks, etc. Seven building slips,
aving docks. Warship output for 1909, 840 tons (British). British
in hand: *Swift, Racoon, Renard, Wolverine*, destroyers. One
dock. Machinery in hand, for *Blonde*, unarmored cruiser. Esti-
yearly output of armor, 10,000 tons; of gun forgings, 5000 tons;
00,000 projectiles.
lon and Glasgow Shipbuilding Company, Govan.—Shipbuilders,
of marine engines. Six building slips. Area of shipyard and
20 acres, employing 3000 men. British ships in hand: *Yarmouth*,
; *Rattlesnake, Chameleon, Comet* and *Goldfish*, destroyers.
nes Ironworks Shipbuilding and Engineering Company, Poplar.—
ilders and makers of marine engines. Six building slips. Area of
26 acres. British ships in hand: *Thunderer*, battleship; *Nautilus*,
er.
rs. Swan, Hunter and Wigham Richardson, Walker and Wallsend-
e.—Shipbuilders, makers of marine engines, dock constructors.
building slips. Area of works, 78 acres. Ship in hand: *Hope*,
er.
send Slipway and Engineering Company, Wallsend-on-Tyne.—
of marine engines and warship machinery. Area of works, 25
One graving dock, two slipways. British machinery in hand, for
battleship; *Newcastle*, cruiser; *Hope*, destroyer.
ntry Ordnance Works, Coventry and Scotstoun, Glasgow.—Manu-
rs of guns, gun mountings and ammunition. Total number of men
ed (when in full working): Coventry, 6000; Scotstoun, 2000.
un-proving ground, with range of 25,000 yards, at Boston.
rs. Firth & Sons, Sheffield.—Makers of projectiles and other war-
quipment. Area of works, 41 acres, employing over 2000 men.
producing capacity, 40,000 tons of steel per annum.
ield's Steel Foundry Company.—Makers of armor, projectiles,
argest manufacturing capacity for common and armor-plate pro-
in the world. Weekly output: above 6-inch caliber, 800 rounds;
caliber, 2000; under 6-inch caliber, 7000 to 10,000 rounds.
rs. Thornycroft & Company, Woolston, near Southampton.—
rs of torpedo craft and machinery. Warship output for 1909
h), 860 tons. British ships in hand: *Savage, Larne, Lyra, Martin*
instrel, destroyers.
rs. Yarrow & Co., Scotstoun.—Builders of torpedo craft and
ery. Building slips, eight. Area of works, 12 acres, with an
nal 12 acres reserved for extensions. Warship output for 1909
n), 3570 tons. British work in hand: Machinery for *Rattlesnake*,
er.

Messrs. J. S. White & Co., East Cowes.—Builders of torpedo craft and machinery. Warship output for 1909 (British and foreign), 300 tons. British ships in hand: *Basilisk*, *Harpy*, *Redpole*, *Rifleman* and *Ruby*, destroyers.

Messrs. Hawthorn, Leslie & Co., Hebburn-on-Tyne.—Builders of torpedo craft and machinery, makers of marine engines. Area of works, 50 acres. Output of warships in 1909 (British), 1330 tons. British ships in hand: *Zulu*, *Scourge*, *Nemesis*, *Nereide* and *Nymphe*, destroyers. British machinery in hand, for *Conqueror*, battleship, and *Collingwood*, battleship (completed); *Blanche*, unarmored cruiser.

Messrs. Denny & Bros., Dumbarton.—Builders of torpedo craft and machinery, makers of marine engines. Warship output in 1909 (British) 1150 tons. British ships in hand: *Pincher*, *Sheldrake* and *Staunch*, destroyers.

Messrs. A. and J. Inglis, Pointhouse, Glasgow.—Shipbuilders and marine engineers. British destroyer in hand, *Fury*.

Messrs. Harland & Wolff, Belfast.—Shipbuilders and marine engineers. British machinery in hand, for battleship *Neptune*. Number of employees, 12,000.

Parsons' Marine Steam Turbine Company.—Marine engineers. Area of works, 23 acres. British machinery in hand, for *Dartmouth*, cruiser.

What is claimed to be a world's naval gunnery record was recently made, according to letters received at Portsmouth, by leading seaman Russell, of the flagship *Minotaur*, on the China station. Firing six rounds from a 7.5 gun, he scored five hits and one ricochet hit in 31.8 seconds. The returns of gun-layers' tests from the squadron thus far mark an improvement on the record of last year, when it headed all the British fleets in average score.

THE NAVAL OFFICER OF THE FUTURE.—Referring to the recent examination at Portsmouth of fifty-four midshipmen who constituted the first group of entrants under the new system of training for naval officers to establish their fitness for passing into the service first as sub-lieutenants, and after two years' further training as lieutenants, *Engineering* says that the occasion is historically interesting, and also of great importance, because it affords an opportunity to once more determining whether the new system will ensure a supply of officers to take up such specialized work as steam engineering, gunnery, torpedo, and electrical work. An analysis of the situation, too, is opportune at this stage, as it is possible now so to modify the original program as to the remaining proportion of the training to be devoted to special practical work, as to rectify any error which may have been made in the course so far pursued. We think a fair case can be made out for such an amendment, and that a review of the situation will demonstrate the necessity that sub-lieutenants, who are to take up the duties of the steam engineering officers, should at once pass into that branch, and concentrate their study upon practical training in the construction and repair of machinery and boilers.

Before stating the case in favor of such earlier specialization than was originally intended, our contemporary thinks it well to glance at the underlying motive and principle of the new scheme, and to inquire how the idea has been worked out in the case of the fifty-four youths who reached the transitional stage. The principle of common entry, on which the new system is based, has much to commend it. Although indefensible, a spirit of caste has crept into the service—a social distinction has been drawn between the military and the engineering branch. While there has been no failure mutually to recognize unity of purpose, professional worth, and personal character in the case of the officers of any department of the service, yet the irrefutable claims of the engineering officers to equality of rank and status with their confreres have been denied by

ary officers with such unreasonable pertinacity as to justify the f that the opposition is inspired by the spirit of caste.

ed with their efforts to break down this widespread feeling, those thority resorted to the establishment of the new scheme of entry, e expectation that time would rectify the error. There can be little t about this being the dominant motive in those who introduced the nt system, and in itself it is to be commended. But there was at ame time the greater reason for doing justice to the present engineer-fficers of the service, and until this is done the action must be re-d as only partly successful.

t the main consideration is as to the principle and prospective efficiency e new scheme. It will be conceded that as a theoretical knowledge hysics, chemistry, and applied mechanics, now constitutes a great of the training, the officer of the future, irrespective of the branch of ervice in which he is ultimately to be placed, will prove more re-eful. The function of a sound education is to create a hunger for ical knowledge, to develop the mind in order to assimilate that ledge, and to cultivate the ability of applying knowledge to useful . *Engineering* can conceive of no better medium for achieving desiderata than the tackling of engineering problems, and conse-ly the authorities will be commended in direct proportion to the t to which engineering has been made the basis of the general train-f the midshipmen who are now about to pass into the service. They already laid a common foundation of knowledge, and from this will the advantage that in action one officer of a given rank may more replace his colleague hors de combat. It must not be forgotten, ver, that the principal function of the warship is to win actions, although the machinery, and particularly the boilers, under modern tions, constitute a vital factor in the fulfilment of this aim, each h—navigation, gunnery, torpedo, electrical and steam engineering— its important part, and needs to be in the hands of men having ighest expert knowledge and skill. The efficiency of any department not be attained at the cost of the others.

t when these arguments in favor of common entry and training have acknowledged, there remains the important question as to the period hich specialization should take place in the case of officers who are ed to serve in one or other of the special branches. Upon this ion the whole success of the new scheme, and its effect on the ncy of warship management, absolutely depends.

the recent past the torpedo and gunnery work has been passed over e military officers, and in their case a special training in the *Ex-t* has followed upon their usual general education. However, satis-ry from the point of view of the management of torpedoes and guns, courses were usually deficient in the extent to which specialized ledge was imparted, notably in physics and applied mechanics. e is, therefore, every reason to believe that the study of engineering ensure a higher efficiency in the case of those who specialize in ery and torpedo work, particularly, if as is certain, the sub-lieu-ts who elect to enter these departments of the service are called to add to the practical knowledge already obtained a special course e gunnery or the torpedo school.

the case of the engineering officers there is not the same certainty proved efficiency. Keyham College proved an admirable school for aining of the engineering student, and the four or five years served while it may not have given the same extent of sea-time as under ew system, certainly produced an engineer with an intimate knowl-of the mechanism which, when in service, he was called upon to ain in the highest efficiency. The youth on leaving Keyham had btedly that hunger for practical knowledge and that acquaintance machinery which may be taken as a proof of sound mechanical

training. Nor, so far, is there much to cavil at in connection with the new midshipmen. The fifty-four who were recently examined were between twenty and twenty-one years of age, and began their training in September, 1903. They spent two years at Osborne College and two years at Dartmouth College, going afloat then for six months in the cruiser *Cumberland*, and subsequently they were appointed to vessels of various types in commission. While at sea they had to continue their studies under the direction of specialists on board, and it was provided that one-third of their time should be devoted to engineering. Several of the engineering officers who had these midshipmen under their charge admit that their attitude towards their work was satisfactory. They were required to perform the same functions as the youths who underwent training at Keyham under the old system, and had experience of watch-keeping. The opinion, however, heard on all sides is that none of the midshipmen liked the engineering work, and this fact is somewhat significant in view of the hope that a sufficient number of these midshipmen will volunteer as entrants in the engineering branch of the service to make up the necessary additions to the personnel. The work in the engine room is not always agreeable, and does not afford the same opportunities for social enjoyment as is the case with the military work. Nor is the income as great when special allowances are taken into account. Under the present system, however, even the fifty-four students who recently sat for their examination are not called upon to volunteer for any branch until two years hence, so that it is not necessary now to consider to what extent the failure of volunteering will necessitate compulsory selection for each branch.

It is opportune, however, concludes *Engineering*, to inquire whether emendation is desirable on the course originally provided for the training of these officers. It will be conceded that as the midshipmen enter upon their service, under the new system, at seventeen years of age, instead of twenty years of age, as with the Keyham students, there is a gain; but against this there is the fact that only one-third of the time afloat between 17 and 20 years of age under the new system is devoted to engineering. Even then, their service is without much responsibility, and probably, also, without a clear understanding as to the why and wherefore of many things which puzzle even the most active mind. Moreover, the lack of continuity is not conducive to concentration. It would therefore be well for those in authority seriously to consider whether the midshipmen who are successful in the recent written tests and oral examination should not be called upon to specialize at once, in order that they may, before their minds and characters have passed the plastic age, and come into continuous and direct contact with the work they will ultimately be responsible for. The period between the ages of 20 and 22 years is of the highest importance in the development of resource, and there is little need to enforce the view that then concentration is of vital importance. Our opinion is that a great part of these two years should be spent at Keyham College and factory, in order that a fuller and more intimate experience should be acquired as to mechanical engineering generally. Indeed, we are satisfied that if this amendment were made to the scheme, a large part of the widespread doubt as to its general result would be dissipated.—*United Service Gazette*.

THE AUSTRALIAN FLEET.—According to the Commonwealth Minister for Defence, the immediate defence policy of the Australian Government is to carry out the work agreed upon at the Defence Conference of 1909 —that is, to provide the unit there laid down, comprising one armed cruiser of an improved *Indefatigable* type, three protected cruisers of an improved *Bristol* type, six destroyers of the river class, and three submarines. The contracts for an armored cruiser, two protected cruisers and two submarines have been placed in Great Britain, and contracts

have been concluded with the government of New South Wales for the construction at Sydney of one protected cruiser, to be named the *Brisbane*, and three destroyers. It is anticipated that the unit decided upon in 1909 will be completed in 1912-1913.—*Page's Weekly*.

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Dante Alighieri	19,000	Gov't Yard, Castellamare.	Launched Aug. 20, 1910.
Cavour.	22,000	" " Spezia.	" Aug. 10, 1911.
Giulio Cesare	22,000	Ansaldo-Armstrong.	Building.
Leonardo da Vinci ...	22,000	Genoa (Odero).	"
Scouts.			
Quarto	3,400	Venice.	Building.
Marsala	3,400	Castellamare.	"
Nino Bixio............	3,400	"	"

THE ITALIAN NAVY.—The *Popolo Romano* describes the recent discussion arising from the statement of the Minister of Marine as a storm in a tea-cup—or, in the Italian phrase, in a glass of water. All that the Minister has done is to ask for money to maintain the normal relative strength of the navy in accordance with the necessities of modern war. If he had not done so, the Italian Navy, which for a time held the third place among the navies of Europe, but has descended to the fourth, would soon fall to the bottom of the scale. The cost of living is greater, everything costs more, and the navy cannot but increase in cost also. In the course of his speech the Minister said that everyone could sympathize with the desire for brotherhood and perpetual peace, but as practical men they must be prepared. Italy is a maritime country, running out like a mole between two seas, and Italians, while they do not compete with the whale, cannot be content to play the part of sardines in a box. The argument that the expenditure might be reduced because of the alliance with Austria-Hungary would merit more consideration if the Italian Navy had anything other than a friendly relation to that of the Dual Monarchy. The *Popolo Romano* declares that the character of Italy's alliances, the sincerity of her friendships, and her desire to settle great or small differences which might lead to misunderstanding, are the proof of her loyal and pacific intentions. If there is any country penetrated with a sense of the necessity of peace, that country is Italy.—*Army and Navy Gazette*.

CURTIS TURBINES FOR ITALIAN CRUISERS.—The Fore River Shipbuilding Co., at Quincy, Mass., has just shipped from their works to the Officine Meccaniche, Naples, Italy, three of six Curtis turbines for the Italian cruisers *Nino Bixio* and *Marsala*. The turbines were loaded at Quincy on the lighter *Commissioner*, of the Merritt & Chapman fleet, and taken to New York, where they were shipped on the steamer *Perugia*, sailing on July 22 for Naples.

ITALY AND AUSTRIA.—From time to time in these columns attention has been drawn to the situation which exists between the allied countries of Italy and Austria-Hungary. It would be a mistake to attach great political importance to the breezy agitation of the Austrian Navy League or the utterances of papers like the *Danzer's Armee-Zeitung*. Nevertheless, it is interesting to know that the paper just named has just published a long article, introduced by a preface from the pen of Vice-Admiral Chiari, a retired Austrian officer, which is devoted to a demonstration of the decisive importance of victory at sea for the conduct of a great war

against Italy. It is well known that the Italians have created extensive defensive works in Venetia, and that there exists a certain doubt or uncertainty as to the attitude that should be assumed toward the Austro-Hungarian ally. It would appear that articles like that to which we refer cannot but conduce to unfriendly relations. The object is to show that Italy is now so strong in Venetia that the possibility of successful military operations is doubtful, unless there should be a command of the sea, only to be gained by a victory over the Italian fleet. In short, the writer says that a decisive naval victory is the chief factor for success in military operations against Italy. He does not hesitate to say that it should be the object of Austria-Hungary to re-establish her supremacy in Venetia and Northern Italy, and therefore he strongly urged his countrymen to prepare for the day of trial. Even if the past were entirely forgotten, it would be necessary to maintain a sufficient fleet to secure the peace of Austria. "As Frederick the Great said, after the battle of Hohenfriedberg, in 1745, that his best allies were his own troops, so must Austria-Hungary say that the best ally of her army is a superior fleet."—*Army and Navy Gazette.*

NEW ITALIAN DREADNOUGHT "CONTE DI CAVOUR."—Yesterday morning, August 10, 1911, this new battleship was successfully launched at Spezia. Admiral Mirabello's crusade against lack of homogeneousness is beginning to produce its fruits, which began to appear in the *Vittorio Emanuele*, *Regina Elena*, *Roma* and *Napoli* type, and in the eight armored cruisers of the *Pisa* class. The former possess good speed and an armament of two 305-mm. and twelve 203-mm. guns; the latter will probably not have their number added to, as opinion has turned in favor of *Dreadnoughts*, of which four were designed by General Masdea.

The *Conte di Cavour* is the second example of these, the first being the *Dante Alighieri*, launched at Castellamare in August, 1910, and the other two the *Giulio Cesare*, in Ansoldo's yard at Sestri Ponente, and the *Leonardo da Vinci*, being built at Odero's at the Foce, both of which are to take the sea next month, and will be completely ready in 1914.

The *Conte di Cavour*, as indeed the other two not yet launched, differ in several points from the *Dante Alighieri*, specially in heavier armor plating—giving them more displacement—and in the elevated turrets adopted after the satisfactory results of the *Minaes Geraes* and the *Michigan*. Their thirteen heavy guns are carried in three turrets for three guns each at bows, stern and amidships, and in two elevated two-gun turrets immediately behind the triple turrets at bows and stern. Their speed of 22 knots gives them 2 knots advantage over ships like the *Arkansas* and *Wyoming*, while the weight of their broadside of big guns is as 0.247 kilos. per ton of displacement, against 0.181 kilos. From the ballistic point of view the *Texas* is also inferior with 0.235 kilos. per ton displacement, and the *English Monarch* is the only one which shows superiority, with her quota of 0.253 kilos. The three new Italian ships have, however, five guns for use in extreme sector firing, against the four guns of the above units. The *Viribus Unitis* class, now being built by Austria, will have, on the other hand, twelve guns of 305 mm. in four three-gun turrets—two of which are elevated—giving them six guns for bow and stern firing, but a lesser broadside weight, and there is much discussion in technical circles as to the respective merits of the two types.

The following are some of the principal details of the *Conte di Cavour*: Length between perpendiculars, 168.96 m.; beam, 28 m.; draft, 8.452 m.; displacement, 21,500 tons; turbines, 24,500 horse-power; speed, 22 knots. There are to be twenty Blechynden type water-tube boilers. The normal coal and petroleum capacity is 1000 tons. The armament will comprise thirteen guns of 305 mm., 46 caliber (weight 64.112 tons, weight projectile 417 kilos.), twenty guns of 120 mm., 50 caliber, and thirteen guns of 76 mm., 50 caliber. There are to be three submarine torpedo-tubes

(two lateral, one stern). The complement will consist of 44 officers and 950 men. A view of the vessel on the stocks is given above.

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Under trial.
Aki	19,800	Kure.	" "
Kawachi	20,800	Yokosuka.	Launched Oct. 15, 1910.
Settsu	20,800	Kure.	" Apr. 1, 1911.
———	24,000	"	Ordered.
Armored Cruisers.			
Kongo	27,000	Vickers.	Building.
Haruna	27,000	Kobe.	"
Kirishima	27,000	Nagasaki.	"
Hiyei	27,000	Yokosuka.	Ordered.
Protected Cruisers.			
Shikuma	5,000	Sasebo.	Launched Apr. 2, 1911.
Yahagi	5,000	Nagasaki.	Building.
Hirado	5,000	Kobe.	"

THE JAPANESE NAVY.—In addition to the battle-cruiser *Kongo*, of 27,500 tons, which Messrs. Vickers are building at Barrow, certain other vessels of the same class are being built in Japan. It has long been known that two others were in hand, but it appears that a third is also to be built. The ship now in hand at the Mitsubishi yard, Nagasaki, has received the name of *Kirishima*, and that at the Kawasaki yard, Kobe, of *Haruna*. The name of the ship to be laid down next month at the Yokosuka dockyard will be *Hiyei*. It is stated that the heavy parts necessary for certain of these vessels have been ordered in England and Germany. The *Kirishima* may be launched at the beginning of 1914, the Mitsubishi Company having taken on 2000 additional workmen for her construction. Three of the vessels, including the one at Barrow, will have Parsons turbines, and one of them a Curtis turbine instalment. There are contrary reports as to the armament of these vessels. One speaks of ten 12-inch guns, another of eight 14-inch guns, and others of various arrangements. In view of this disparity of statements it would be well to distrust any of them.—*Army and Navy Gazette.*

Orders have recently been placed in Japan by the Japanese Government for four new armored ships of the super-*Dreadnought* type. With the battle cruiser laid down at Barrow last January, this makes five super-*Dreadnoughts* in one year.

The new battleship, says the naval correspondent of the *Daily Chronicle*, is to be built in the Imperial Dockyard at Kure, where the 20,800-ton *Dreadnought Settsu* was launched last month. This vessel is stated to have a displacement of over 25,000 tons and to be armed with twelve 13.5-inch guns.

In the Imperial dockyard at Yokosuka, where the *Kawachi*, a sister ship to the *Settsu*, is now nearing completion, is to be built an armored cruiser of 28,000 tons, to be armed with ten 13.5-inch guns. A vessel of similar type is to be built at Kobe and at Nagasaki by the Kawasaki and Mitsubishi Companies respectively. Neither of these concerns has built an armored ship before, but they have signed contracts for the completion of the 28,000-ton *Dreadnoughts* in three years.

JAPANESE NAVAL PROGRESS.—The series of papers read by Japanese delegates to the Jubilee Congress of the Institution of Naval Architects was not only of great interest, but of historical value as well. The first,

by Rear-Admiral Motoki Kondo, dealt with naval construction in Japan, beginning with the building of the *Chiyoda Gata*, the first warship on the European model, and tracing the development from this wooden gunboat of 1862 to the *Kawachi* of to-day. Dealing with the four navy yards, the writer showed that the Yokosuka dockyard, the first sod of which was turned in 1865, but which now employs over 8000 men, had built only third-class cruisers or small craft of less than 3000 tons up to 1904, when the *Satsuma*, of 19,200 tons, was begun. At Kure dockyard, commenced in 1889, the *Tsushima*, of 3366 tons, was succeeded by the *Tsukuba* and *Ikoma*, of 13,750 tons. Although the first armored vessel built in Japan, the *Tsukuba*, was the most powerful armored cruiser in the world when built and until the *Invincibles* were completed. At the present time the Yokosuka yard has in hand the battleship *Kawachi* and a 27,500-ton armored cruiser similar to the ship building at Barrow, while at Kure the *Settsu* is in hand. Of the other two yards, that is Sasebo, near Nagasaki, is completing the *Shikuma*, of 5000 tons, but principally repair work is done here; while the Maidzura yard, the only one in the Sea of Japan, is engaged in building torpedo craft, although equal to heavier work. Japan is fortunate in possessing two large private yards, at Nagasaki and Kobe, and Rear-Admiral Kondo announced that each of these firms has received an order for a battle-cruiser similar to that ordered from Vickers. These private yards built the *Mogami* and *Yodo*, despatch vessels, but have not hitherto undertaken armored ships. Armor plate is supplied from Kure navy yard, where plant was started in 1902, the plates being made by a special process invented by Japanese engineers. Sufficient progress had been made in three years to justify armoring the *Tsukuba* with Japanese plates, and the output is now equal to all requirements.

NAVAL ENGINEERING IN JAPAN.—There were three other papers contributed by Japanese members of the institution, one on the development of mercantile shipbuilding, another on the design and performance of the new Trans-Pacific liners *Tenyo Maru* and *Chiyo Maru*, and one on naval engineering, by Engineer Rear-Admiral Terugoro Fujii, I. J. N. The first-named paper showed the encouragement given in recent years to the shipbuilding industry by the Japanese Government, and how in their turn the private yards are now able to undertake large warship contracts for the Japanese Navy and for other powers as well. The *Tenyo Maru* and *Chiyo Maru* are new liners which burn oil fuel only, but an uncertainty in supplies last year led to some of the boilers being adapted for coal, when it was found that the consumption of coal was 20 to 22 tons against 14 tons of fuel oil. Admiral Fujii's paper contained much important information in a small compass. In regard to turbines, a Parsons installation was tried in the *Mogami* in 1907, and in the same year the Curtis turbine was adopted for the *Aki* and *Ibuki*. The new battleships *Kawachi* and *Settsu* will also have Curtis turbines, as will one of the four new battle-cruisers, but the three other vessels of the latter class, including the one building at Barrow, will be fitted with Parsons turbines. The horse-power to be developed by the engines of these battle cruisers will be 64,000, and they will each have four screws. The last armored ships having reciprocating engines were the cruiser *Kurama*, which was present at the naval review the other day, and the *Satsuma*, battleship. The following paragraph, dealing with the effect of the recent war upon the machinery of the ships engaged, is interesting:

It is gratifying to mention that the machinery of our squadrons had not shown any defects such as to affect the action of our fleet during the whole course of the recent war, and it may be worth mentioning that some of the warships were continuously under steam for over 2000 hours. The only noticeable trouble which our engineers experienced was the leakage of both main and auxiliary condenser tubes. Also I may add that the spare parts of auxiliary machinery were found indispensable, they having been used very often.—*Army and Navy Gazette.*

RUSSIA.

…ESSELS BUILDING.

…ment.	Where Building.	Remarks.
[illegible]	St. Petersburg.	Under trial.
[illegible]	"	Building.
[illegible]	Nicolaiev.	Under trial.
[illegible]	St. Petersburg (Baltic Wks.).	Launched June 24, 1911.
…3,000	" "	Building.
…3,000	" (Admiralty Yd.).	Launched in June.
…3,000	" "	" Building
7,800	St. Petersburg.	Under trial.
7,800	"	" "
6,750	Sevastopol.	Building.

…e brought up to its full strength of sixteen battle-…o. The life of a battleship is to be twenty-two … laying down, four of which are to be spent in … twelve with the active fleet, and eight years with …s term ships will be struck out of the fleet list …f the cruisers is fixed at eighteen years. The … the active fleet into the reserve thirteen years …r term in the reserve is fixed at five years. The … fixed at seventeen years. After these terms have … classes will be replaced by new vessels. Warships …re to be replaced at once.—*Page's Weekly.*

…be erected in the Baltic with two dry docks for …k for cruisers, a floating dock taking 30,000-ton …agazines, etc. This new base is to be fortified …a side. By 1924, the first year in which the two …ll be completed, the new base is to be enlarged, …cks. By the same year there is also to be created … stores and magazines. By 1914 Kronstadt is to …ar base, the existing wharves and workshops are … roadstead is to be deepened, and the battleship …construction is to be completed.

… is to take place at Sevastopol, where there is to … battleships, and a floating dock of 30,000 tons …Nikolaievsk is to be equipped to be the chief con-…lack Sea fleet. It is to have new building slips …g dock. The port of Vladivostok is to be suffi-…orks entailed by the maintenance of the Pacific …his bill, the first squadron of the Baltic fleet, con-…ps, will be ready by 1918; in 1920 half the second …, the total in battleships then being 12; and in …ll be ready. The bill does not go into the matter …ning in the preamble that Russia can afford the …

…ils were given last Friday by the Berlin corre-…*inster Gazette* concerning the Navy Bill which is …e Russian Duma next autumn. The bill, it is … reconstruction of the fleet on a large scale, and is …iple of a fixed building program, for a term of …d for the replacement of worn-out warships. It … of the Baltic and Pacific fleets, including minor

vessels, and fixes a standard for the strength of the fleet in the Black Sea.

The bill provides that the permanent strength of the Russian fleet in the Baltic shall be two squadrons, each consisting of eight battleships, four armored cruisers, eight cruisers, thirty-six torpedo-boats, and twelve submarines, in addition to which there will be a reserve squadron consisting of superannuated ships. The Black Sea fleet is to consist of one squadron, which is to be kept at a strength one and a half times as great as the naval forces of the other States with Black Sea coasts. The absolute strength is not fixed, on the ground that the future naval strength of the Black Sea States is not known. In this case the Minister of Marine is to ask for credits for building in Budget form from year to year. For practical reasons it is impossible to create a Pacific fleet fit to cope with a probable enemy. The naval forces, therefore, will consist only of two cruisers, eighteen torpedo-boats, twelve submarines, and three counter-mine-ships, with the usual auxiliary vessels.—*Page's Weekly*.

RUSSIA PUTS OVERBOARD HER FIRST "DREADNOUGHT."—Russia's first *Dreadnought Sevastopol*, was launched successfully June 29, 1909 from the Baltic works, in the presence of the Ministry of Marine, naval attaches, a large representation of society, the legislative bodies and officialdom.

The battleship was laid down on June 16, 1909, and it is expected that another two years will be occupied in equipping the vessel. The *Sevastopol* has a displacement of 23,000 tons, and with 42,000 horse-power is expected to develop a speed of 23 knots an hour. Her length is 590½ feet, and the beam is 87 feet. Her armament will consist of twelve 12-inch guns, sixteen 4.7-inch guns and smaller artillery. All of the vessel and its equipment has been or will be built in Russia.

THE RUSSIAN NAVY.—Two Russian battleships, the *Sevastopol* and *Poltava*, have just been launched with perfect success. The length of the ships is 590 feet 6 inches, the beam 87 feet, and the draft 27 feet 3 inches. The displacement will be 23,000 tons, and engines of 42,000 horse-power are intended to develop a speed of 23 knots. The total coal capacity will be 3000 tons, and the capacity of a liquid fuel 1170 tons. The turbines will have four screws, and there will be twenty-five modified Yarrow boilers. As is already known, the armament will consist of twelve 12-inch guns in four turrets and sixteen 4.7-inch guns. The *Petropavlovsk* is to be launched on August 28, and the *Gangut* on October 28. It does not appear that the orders have yet been placed for the three *Dreadnoughts* intended to be built in the Black Sea.—*Army and Navy Gazette*.

SPAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
España	15,400	Ferrol.	Building.
Alfonso XIII	15,400	"	"
Jaime I	15,400	"	Ordered.

TURKEY.

FOREIGN "DREADNOUGHTS."—A report from Constantinople states that the final contract for one *Dreadnought* of 21,500 tons was signed on June 14 by the Minister of Marine and a representative of the Armstrong group, with an undertaking that Turkey shall order a second *Dreadnought* from the same group, if and when the necessary credit is voted in parl-

ed that the Chilian Government are considering tenders for
ıips of greater dimensions than the present *Dreadnoughts.*
rships will each be of over 30,000 tons, and carry an armament
ıch guns. They will thus be the most powerfully armored
ıt, in addition to which they will possess a speed approximat-
of our present *Dreadnought* cruisers. Tenders for the two
been submitted by the principal British shipbuilding firms, as
ı several on the Continent. Some weeks will yet elapse before
s will be awarded, but there is every probability that they will
tain. The ships will cost nearly two and a half millions each.

UNITED STATES.

VESSELS BUILDING.

e. hips.	Speed. Knots.	Where Building.	% of Completion July 1.	Aug. 1.
....	20¾	Navy Yard, New York.	94.3	98.1
....	20¾	New York Shipbl'g Co.	99.2	99.6
....	20½	Wm. Cramp & Sons.	68.8	70.8
....	20½	N. Y. Shipbuilding Co.	68.4	71.3
k...........	21	Navy Yard, New York.	1.3	2.5
....	21	N'pt News S. B. Co.	19.3	24.8

TED STATES NAVY.—The battleships of the program of 1911-
ount twelve 14-inch guns in four triple turrets. There has
t conflict of opinion upon this question, but it is assumed that
are fully satisfied as to the success of the system, and that the
nd Russians are acting with full confidence in their own
nd tests. The merit of such an arrangement does not consist
roviding for a full broadside for all the guns. The larger
from the constructor's point of view, is that it will place all
iddle line, and will economize in space for internal arrange-
ıding the simplifying of magazines and the system of am-
pply, and will also conduce to economy in the weight of steel.
r intended that the secondary or anti-torpedo armament shall
vantageously placed. On the whole, it must be admitted that
rangement possesses considerable merits, and perhaps the only
es are those which were recently pointed out by Sir William
doubted the wisdom of putting too many eggs in one basket,
the maintenance of rapidity in loading and firing individual
h a turret. Constructors, however, have an open mind upon
, and are looking forward with great interest to the comple-
ships now in hand.—*Army and Navy Gazette.*

de attention is being attracted to the new wireless towers
ɔ be erected at Arlington by the Navy Department. The con-
towers was let on June 20 by the Bureau of Yards and Docks
more Bridge Company for $105,000. When complete the plant
out $150,000. It will be the largest high-powered station in
As stated previously, the top of the highest tower, which will
from its base, will be over 200 feet higher above the sea level
'ashington Monument. It is estimated that the station will
us of communication of about 3000 miles.

LAWARE."—The Americans are justly proud of the *Delaware,*
w York Sun states that she is one of the finest *Dreadnoughts*
will certainly be one of the finest *Dreadnoughts* at the Spit-
v. Recently she steamed 17,000 miles—to Valparaiso and
er captain reported that she required no repairs, and that her

engines, boilers, ship and *personnel* were in excellent condition, ready for any duty. In order to test the bearings, with 10 boilers out of 14 under forced draft, the ship attained a mean speed of over 20 knots for a short period, everything working well. Comparisons have been made greatly to her advantage with the *Oregon*, which, during the war with Spain, also went round the Horn. But the *Delaware* has almost doubled the displacement, and yet the cost of coal per mile in running her was less than 75 per cent of the cost in the case of the *Oregon*. Just before the *Delaware* sailed from Hampton Roads, on January 31, with the body of the deceased minister from Chile, Senor Cruz, on board, she had completed a voyage of 9000 miles to Europe and back. The Americans are asking if any other great warship in the world has displayed such ability in sustained cruising. The *Delaware* has been prepared at the New York navy yard for her visit to England, and as the *New York Sun* says there will be no finer ship in the line, without doubt she will receive the unaffected praise of foreign naval experts.—*Army and Navy Gazette.*

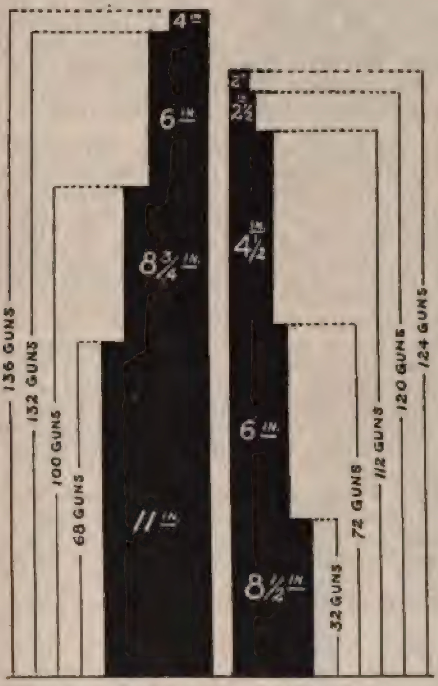
AMERICAN NAVY YARDS.—The subject of navy yard, or, as we should call it, dockyard administration is at present very much alive in the United States, and is really the cause of Secretary Meyer's visit to this country. A special board has been constituted to make recommendations to secure efficiency and to prepare for up-to-date management. There is to be a report on co-ordination of work, the employment of officers and men from the ships on repairs in the yards, and the placing upon naval officers of responsibility for the self-maintenance of the fleet, so that they, and not the navy yards, may determine when work upon ships shall be done at the yards. In this connection attention is to be given to the question of building a completely modern repair ship. Other subjects to be reported on are improvements in the system of accounts, the regulation of work in the yards and of labor in due proportion, rewards for individual merit in work, the advisability of continuing or discontinuing certain classes of work in the yards, and the arrangement of a course of study and lectures on methods in practice in modern management for midshipmen at the Naval Academy. Meanwhile the so-called "Taylor system" of shop management, which originated with Mr. F. W. Taylor, of Philadelphia, is supposed to promise greater economy and efficiency in engineering and other shops. The fear that it may be applied is exciting opposition amongst the employees. Naval Constructor Evans has also written on the subject, and points to the Mare Island yard as a well-managed institution made capable of competing with eastern yards where wages are much lower and the cost of material less.—*Army and Navy Gazette.*

It is announced that the American Navy Department proposes to test "incinerators" on warships. In the recent cruise of the American battleship fleet the slower service ships reported that they had no difficulty in trailing the fighters by the litter which floated in their wake for miles. Experts consider that this is a dangerous condition in time of war, and, therefore, for the sake of covering the trails and for sanitary purposes, incinerators are being tested.—*Page's Weekly.*

A COMPARISON OF THE GERMAN AND AMERICAN NAVIES. By H. D. Brandyce.—One of the most fruitful topics of the day seems to be the phenomenally rapid growth of the German Navy; and the notion is widely held that the Kaiser is adding to his fleet for the purpose of challenging England's age long supremacy on the sea. Now, whatever may be the Kaiser's idea, such a contingency is not likely to be realized for many years to come, for not only is Germany's naval strength still far inferior to Britain's but it is at the moment of writing also vastly less than our own.

BATTLESHIPS SHOWING PENETRATION OF KRUPP ARMOR AT 8000 YARDS.

Herewith is given in graphic form a diagram showing the overwhelming superiority of the American battle fleet in the matter of heavy guns; 68, or exactly half of the total, being 12-inch rifles capable of successfully attacking at 8000 yards the heaviest armor worn by the Germans. On the other hand, not a single one of the Kaiser's ships could at that distance pierce the main belt of any of the Americans, and only 32 of the newest rifles (11-inch, 45-caliber) would be effective against the Yankee topsides.



This diagram shows that the batteries of United States ships have far greater penetrative power than those of the German ships.

In time of stress it is the armored ships that count, and the tables given above demonstrate beyond peradventure of a doubt the present offensive superiority of the United States fleet.

Germany is contemplating equipping her newest *Dreadnoughts* with ordnance of 12.2-inch caliber, but these undoubtedly powerful weapons will be more than compensated for by the new 14-inch rifles which are to be mounted in our *Texas* class, recently laid down. All this, however, is beside the question, as our object has been to demonstrate that at the middle of the year 1911, the German Navy, far from being a menace, is not by any means the equal, offensively, of the fleet that flies the Stars and Stripes.—*Scientific American.*

MARINE ENGINEERING.

FIAT MARINE OIL ENGINE.—The Fiat Company, of Turin, well known as a maker of motor cars, has, of recent years, taken up the manufacture of heavy oil engines. The first engines made were of a light and high-speed type, designed especially for use on submarines, torpedo-boats, or auxiliary craft attached to large warships. On these the experimental work was done, and when their success, particularly as regards reversibility, was assured, larger sizes were taken up, and to-day the company has under construction heavy oil engines to the extent of many thousands of horse-power, both for marine use and for fixed plants on land. The motors are all of the single-acting two-cycle Diesel type, and are made for either high or moderate speed. The number of revolutions of the latter varies between 150 for the 1000 horse-power motor to 300 for the 100 horse-power motor, the weight of the motor with accessories being about 40 to 50 kilos. per horse-power. The number of revolutions of the high-speed type varies between 600 for the 100 horse-power, and 450 for the 1000 horse-power motor, the weight being from 16 to 20 kilos. per horse-power.

An example of the latter is illustrated in *The Engineer*. It is a 600 horse-power motor which makes 500 revolutions per minute. The general arrangement of this motor will be easily gathered from the engraving. The cylinders are all cast separately, and there are no independent scavenging pumps, the main pistons being of two diameters, of which the upper and smaller part forms the motor piston, whilst the lower part works as an air pump. This arrangement permits a marked reduction in the length of the motor and improves the balance. The upper part of the crank chamber serves as a reservoir for the scavenging air which is compressed to about 0.2 to 0.4 atmospheres, according to the number of revolutions. The air is conducted to the scavenging valves through passages cast with the framing and cylinders. There are two scavenging valves for each cylinder placed on the cover with the oil valve and the compressed air inlet valve for starting. The exhaust, as is usual with two-cycle motors, takes place through ports in the motor liner which are uncovered by the piston.

The high pressure compressor is of the two-stage horizontal type, and is driven by an extension of the crank shaft. In front of the motor, and driven by the main shaft at reduced speed, there is a group consisting of the water pump for cooling the cylinders and a lubricating oil pump; this oil is also used for cooling the piston, as water cooling in types of such reduced dimensions would present difficulties and the possibility of inconvenience.

The valve lay shaft is supported by brackets as shown, and is driven by the main crank shaft by means of a vertical shaft and two pairs of helicoidal wheels. The valves of each cylinder are driven by a single angular cam, which receives an oscillatory motion from an excentric keyed to the lay shaft. At one of its two extreme positions this cam opens the two scavenging valves, and at the other lifts the fuel valve. This simple arrangement is made possible by the fact that in the normal distribution of these motors fuel admission and scavenging are 180° of a revolution apart. Hence it follows that to change from forward to astern gear, it is sufficient to change the angle of the excentric on the main shaft, and this change is made by moving axially on the vertical shaft the helicoidal wheel working the horizontal shaft. The displacement is made by compressed air.

The operation of the valves for starting by compressed air is obtained by double-profile cams—one for each cylinder—which are keyed on the horizontal shaft, and which can be moved in the direction of the axis by a small shaft in the interior of the lay shaft itself, which is hollow; the two extreme positions give the movement ahead or astern, and in the center position the valves are closed.

Starting, reversing, and regulating the power and number of revolutions are controlled by means of a lever and handle, which are seen in front of the "maneuvering box," placed near the extremity of the motor. The upper lever serves to displace the helicoidal wheels on the vertical shaft, as already mentioned, and the cams which work the starting valves on the horizontal shaft, whilst the lower handle regulates the stroke of the fuel pump. The working is very simple, and in the official trials made on a motor of this type for the Italian Royal Navy it was found possible to reverse the motor easily in five seconds, starting at full speed.—*The Engineer.*

The French Navy Department, we hear, is contemplating using petroleum residues more extensively for heating marine boilers. The Minister of the Marine is quite in favor of it, and is now engaged in promoting a number of plans which will lead to a more extensive use of this fuel. All the new torpedo destroyers of the navy are, it is said, arranged for firing the boilers with petroleum residues of European origin. At ports such as Toulon, Brest and Cherbourg there are now being installed oil reservoirs in which the petroleum residues will henceforth be stored up, and a steamer to be used specially for oil transport has been acquired by the navy. It will ship oil at Constanza and will then bring it to the French ports and fill up the reservoirs directly. It is also of interest to note, adds the source of our information, that the 26,000-ton battleships *Courbet* and *Jean Bart* of the French fleet, as well as the new units which are to be constructed, will be fitted with the necessary appliances so that they can burn crude oil or residues at the same time as coal, making thus a combination system.—*The Engineer.*

The application of the producer gas plant for marine purposes seems to be making headway. The latest news on this subject comes from Seattle, where a 900-ton three-masted iron barkentine, 185 feet in length with a beam of 32 feet, is being converted for this system of propulsion. There are several interesting points about this vessel. The producer, which is of the up-draft type, is 9 feet in diameter, 10 feet high, and is intended to work on a low grade of lignite costing about 4s. per ton at the mine. The main engine is of the four-cylinder type and will develop 300 horse-power at 200 revolutions per minute. Power is transmitted through a friction clutch to a reversible propeller. The latter is 82 inches in diameter and is of the feathering blade type. The reversal of the propeller blades and the operation of the clutch are pneumatically controlled. The vessel is to be employed for carrying lime in barrels to San Francisco and is fitted with a wireless telegraphy outfit. The total cost of the conversion will, it is said, be about £7000, but it is believed that in less than two years the vessel will have repaid this by her increased earning capacity. A feature of the vessel lies in the fact that in case of fire in the hold where the lime barrels are stored, the exhaust from the engines can be turned into the hold so as to smother the fire in carbon dioxide.—*The Engineer.*

TURBINE-DRIVEN SHIPS.—The subject of the propulsion of ships continues to occupy the attention of engineers to a very marked degree, as is exemplified by a paper read recently before the Liverpool Engineering Society by Mr. J. K. Catterson-Smith, A. M. I. E. E., on the manufacture of turbo-electric generators and some of their applications to marine work. In a recent issue we dealt with the subject from the broad standpoint of the relative merits of toothed gears, hydraulic gears and electric gears, consequently it is unnecessary to go over the same ground again, but we think it may interest our readers if we deal with some points of detail raised by Mr. Catterson-Smith on the matter of electric gears. It must be remembered that up to the present, although the two former

gears have been applied on ships and results have been obtained, *there* is no record of any example of the latter gear having been install*ed* on shipboard and practically tested. The author claims that the chief advantages of electric drives are: No practical limit to power, electromagnetic gear in place of teeth, simple methods of varying the gear-ratio, maintenance of efficiency over large range of power by sub-division of generators, and no uncertainty regarding operation and durability of plant. Apart from questions of weight and economy, it is absolutely essential that the electric coupling should admit of an extensive range of speed control, together with effective reversing powers for braking and going astern while the vessel is being maneuvered. The types at present available are direct current motors, single-phase commutator motors, and polyphase induction motors, all of which are capable of variable speed control. Direct-current motors would be supplied by direct-current turbo-dynamos, and single and polyphase motors by turbo-alternators. There would appear to be a certain similarity between electric train haulage and ship propulsion, thus pointing to the advantages of propeller motors having such characteristics, although it may be agreed that the characteristics of induction motors would meet the requirements of all vessels except those in which exceptional maneuvering capabilities are required, as the turbine itself is capable of a wide speed range. The direct-current system has important advantages in the matter of flexibility as to speed and torque to meet the requirements of the vessel, while the propeller motor can be of any size if the voltage is increased with the size of the unit. The author cites the case of a rolling-mill motor which was capable of giving 12,000 brake horse-power at 60 revolutions per minute on 880 volts. The speed control of such motors is easily obtained by variable voltage generators, motor field control, or compound winding on the motor field. When the ship is to be stopped, the propeller driving the motors would enable the latter to regenerate and deliver back energy to the main generators, where it would be absorbed by a water-cooled brake, or a steam-blade brake, or the energy could be dissipated by resistances. Although propeller motors of large power present no difficulty, it is found that present-day direct-current turbo-dynamos have a distinctly limiting feature in the matter of providing commutator capacity, and in support of this the author gives some interesting tables and formulæ showing the maximum voltage possible under certain conditions. With regard to polyphase generators, it is pointed out that commercial firms are prepared to construct motors up to 3000 brake horse-power continuous rating. The limitations as to size of this class of motor are not of any serious moment, but whatever they are, the principal difficulty will be with the propeller motors, instead of with the generating sets as in the direct-current system. Dealing now with polyphase induction motors, it is pointed out that this system in various forms is the one most applicable, owing largely to its simplicity. Some interesting particulars are given in the paper of an extremely simple three-phase system recently proposed to the U. S. Government for a battleship. The main machinery was to consist of two 12,000 K. W. three-phase generators having a maximum speed of 1200 revolutions. Twin screws with two 7000 horse-power motors to each shaft were to be fitted, thus with full load 28,000 horse-power would be transmitted. When at full power the two motors forming one set each have 30 poles, the gear ratio then being 7½ to 1, and under these conditions the speed would be controlled by the turbine speed. For lower speeds one generator and one motor on each shaft would be cut out, leaving the gear ratio the same. For still lower speeds the number of motor poles would be changed to fifty, giving a gear ratio of 12½ to 1, and the turbine be allowed to work over its whole speed range again. Some interesting tables of gear ratio between alternator and motor are included in the paper.—*Marine Engineer and Naval Architect.*

ELECTRIC PROPULSION OF SHIPS.—As is well known, there are many advocates of the use of electricity as a means of propulsion, and from some points of view there is no doubt it has its attractions. The combination of steam turbines and electro-motors offers one solution of the speed reduction problem for propellers.

The Hon. C. A. Parsons considered the chief difficulty would be the danger of leakages and possible short-circuiting, which would, of course, be an added menace to marine engineering.

As we have before mentioned, Mr. H. A. Mavor, of Messrs. Mavor & Coulson, electrical engineers, Glasgow, is a firm believer in the future of electric propulsion. He pins his faith to the alternating-current, and not the continuous-current system, and claims that the only possible solution of the problem for large powers is in the alternating system.

He has recently backed his opinion by constructing an experimental vessel thus equipped, which has been appropriately named the "Electric Arc," not as a facetious individual termed it, the "Electric Ark," although she certainly does enshrine the symbols of Mr. Mavor's faith. The boat was constructed at Dumbarton, and is 50 feet long by 12 feet broad, having a moulded depth of 7 feet 4 inches. The original equipment consisted of a 45 brake horse-power four-cylinder Crossley gas engine operated with producer gas, for which a suitable producer and scrubber were provided. The engine drives a direct-coupled alternating-current dynamo or generator, with its exciter. From this generator the current passes to an alternating-current motor, which is in its turn coupled direct to the propeller. This system offers two advantages. One is that the switch system may be operated either from the engine room or from the bridge; the other is that the engine and generator shafting need not be in alignment with the motor propeller shafting, and thus engine-room space may be more economically made use of. In this experimental vessel only one engine and propeller were used; she is for short trips on coastal service.

Gas is supplied from the producer on the suction principle to the engine, which is coupled to an alternating-current generator. The continuous-current exciter is driven by belting from the engine shaft, and is mounted upon the top of the generator. The alternating-current motor is a multiple-wound machine in which there are two independent windings, the current is alternating three-phrase, and the motor is extremely simple in construction.

There are no brushes, and no slip rings. The novelty of Mr. Mavor's invention lies in the arrangement of the stationary conductors and the method of supplying them with current.

Control of the motor is through two simple switches. One of these controls the excitation of the generator-magnet, and by its means the supply of current from the generator to the motor can be regulated from zero to maximum.

The second switch is interlocked with the first, so that it can only be put into operation when the current is shut off. This switch controls the direction of the current supply to the motor in one or both of its windings, and by this means gives either slow or full speed, ahead or astern.

Mr. Mavor claims that the increase of efficiency attainable by making the motor revolutions suit the propeller and the generator revolutions suit the engine is considerable, and no doubt he is right in this. It is especially true perhaps at lower speeds than the maximum of which the ship is capable.

The system was tested as a whole, and has made a 15 hours' non-stop run with the gas producer and gas engine; but for investigation purposes it has been considered desirable to take out the producer plant and gas engine and install a petrol motor of the same power.

The vessel was tested in the Gareloch at the end of May, and attained a speed of 8¼ miles per hour. We do not learn much from that fact, but perhaps more important was the test of the control of the ship. The

switches were connected to an ordinary Chadburn telegraph instrument, with chain connection to the main switch in the engine room. The control of the engine was thus in the hands of the navigator on the bridge, and a feature of the trial was the ease with which the vessel could be made to go ahead or astern. The demonstration also included running the vessel with power on one winding of the motor and on two. One circuit alone gave two-thirds of the speed with two.

A number of maneuvers were carried out, including stopping, starting and speed changing, and gave great satisfaction. The method of control used dispenses with resistances and auto-transformers for regulating voltage supply to the motor, the only resistance required being in the exciter circuit, where the current is comparatively small, and the necessary resistances simple and compact. The trial proves the mechanical possibilities of the scheme. What we want to know now is the relative weights of producer, scrubber, engine, generator, and motor, as compared, say, with a petrol engine directly coupled to a propeller, and suitable for giving the boat the same speed. It would also be interesting to know the comparison between the weights of machinery according to Mr. Mavor's plan and those of a vessel fitted with water-tube boilers and turbines. On the surface it appears likely that the weights would be heavy, but no doubt Mr. Mavor, as a result of this experiment, will be able to make a close estimate of these particulars.—*Army and Navy Gazette.*

At the summer meeting of the Institution of Mechanical Engineers of Great Britain, in Zürich, during the last week of July, a paper was read on "Modern Diesel Oil Engines," by Mr. F. Schubeler, which developed an extended discussion by representatives of the leading European manufacturers and engineers.

It was stated that engines of 2-cycle type developing 1000 brake horsepower per cylinder, are now under construction for marine service by a number of firms and that units of 500 brake horse-power per cylinder were in satisfactory service.

The European engineers have found it practical to use almost any mineral oil for fuel in these engines, even heavy tarry oils.

The calorific efficiency of these engines is about 30 to 40 per cent in the best practice, which means that with oil at 50 shillings per ton, power can be produced for about 0.11 d. to 0.13 d. per brake horse-power hour.

The weight of these large units is practically the same as that of cast-framed triple-expansion steam engine of equal power, or a 100 brake horse-power unit would weigh about 40 tons. The space occupied is the same as for the steam engine, so that the weight and space of boilers, condensers and other auxiliaries are available for other purposes.

It would seem that when this type of prime mover has proved its reliability and flexibility for marine service, it cannot help but be adopted.—*Engineer.*

MISCELLANEOUS.

ENGINEERING EDUCATION.—The Pittsburgh meeting of the Society for the Promotion of Engineering Education was held June 27, 28 and 29 at Carnegie Technical Schools and the University of Pittsburgh.

Engineering English.—The Tuesday morning session opened with two papers on English, a subject to which the society has properly devoted a great deal of attention. Prof. S. C. Earle, of Tufts College, described original plans which he has used in training engineering students in technical writing. He advocates special drill in English for these students, but he also regards general training in English as an integral part of a technical education. He does not, however, cling to traditional methods of instruction as do some instructors who, in Professor Earle's

words, "regard English as the last bit of salvage from the arts course remaining in the engineering school and as the only means of culture in a curriculum otherwise hopelessly practical." The art of clear expression involves clear thinking, especially if the description relates to other than visual images and symbols. Hence, if a student can be taught to write so as to impart accurate information he has been trained in thinking, which is, after all, the real function of a technical education. Following Professor Earle's paper, another of somewhat similar character was presented by Pro. F. N. Raymond, of the University of Kansas, on the preparation of written papers. He emphasized, as the essentials for success in technical writing, (1) accurate and thorough observation, (2) clear perception of other men's viewpoints, (3) correlation of ideas, and (4) good workmanship. By writing reports with these elements in mind an improvement will result whether the instruction is given by the department of English or formally by no department at all. In the discussion following these papers Prof. J. M. Telleen, of Case School, referred to logic as the basis of all work in English and every other subject. He defined rhetoric as "expression with the highest efficiency." Mr. William Kent believed that English can be taught best to engineering students in the engineering school and that engineering reports should be the basis of study of "engineering English."

Industrial Training.—Several speakers at the Tuesday and Thursday sessions emphasized the close connection which must exist between theoretical training and practical work. A recent interesting experiment at the University of Missouri was described by Profs. H. Wade Hibbard and H. S. Philbrick. They have attempted to teach the principles of scientific shop management by means of the engineering school shops. These shops have been organized as "management laboratories" and work has been put through them in accordance with the modern methods of "efficiency engineering." The experiment is so recent that only preliminary results could be reported, but apparently the students have entered into the spirit of the plan and are profiting by it. A paper based on a wide experience with technical graduates was presented by Mr. E. B. Raymond, vice-president of the Pittsburgh Plate Glass Company, under the title "The Technical Graduate from the Point of View of the Manufacturer." It was appreciated by the society because of the intimate knowledge of human nature which it exhibited. Mr. Raymond said that "it seems to me absurd to expect a college in four years to turn out men freed from their natural weaknesses when one considers the quality of the average human being who enters." Among these weaknesses he mentions laziness, disinclination for practical work, lack of seriousness and ability to assume responsibility, and lack of ability to become a part of a workingman's life. He believes that less "good time" and more "office atmosphere" would improve the college life. He gives as the requisites of success in engineering character, health, ambition and specific training.

Messrs. C. F. Scott and C. R. Dooley explained to the society a new plan for adapting technical graduates to the electrical business. The Westinghouse Electric & Manufacturing Company has modified the apprentice plan which has been used for some years by dividing the two years of its apprentice course into two periods. In the one period a more thorough but less extensive shop training will be given and this will be supplemented by classroom instruction. In the other period some one specialty will be taken up and mastered by each apprentice. The University of Pittsburgh is introducing a co-operative plan involving four twelve-week periods per year for four years. The first and last years will be spent in school, but during the second and third years the student will spend alternate periods of three months each in shop and in school. Dean F. L. Bishop hopes by this plan to meet the criticisms of the

technical graduate from the standpoint of employers in relation of their immediate adaptability to industrial conditions.

Teaching Mathematics.—An important feature of the Pittsburgh meeting was the reception of the report of the committee on the teaching of mathematics to engineering students. This committee was appointed four years ago by the American Mathematical Society and the American Association for the Advancement of Science and it was directed to report to both the American Mathematical Society and the Society for the Promotion of Engineering Education. The first purpose of the committee was to compile statistics regarding mathematical instruction in technical schools, but later the plan was changed to the present one. The report as presented and, fortunately, accepted, comprises syllabi of the essential elementary mathematical subjects, algebra, trigonometry, geometry, analytical geometry and differential and integral calculus. The plan included a syllabus of "dynamics" or theoretical mechanics, but this was found impracticable for this year on account of lack of time to secure agreement as to the essentials of this subject. The report is an outline of the theorems which every engineering student should know well and which a professor should be justified in assuming as a reasonable mathematical preparation for his work. The committee believes that this is an adequate average preparation, but that if more advanced mathematics is needed in particular courses this should be taught in connection with those courses. Before accepting the report the society debated a number of details, such, for example, as the necessity for including vectors and complex quantities. These subjects were desired by the electrical engineering teachers and others. In accepting the report it was ordered published in the *Proceedings*, where it will be available for general use about January 1, 1912. The report appeared in full in recent numbers of the *Bulletin* of the society.

Prof. E. B. Paine, of the University of Illinois, gave an extended outline of the methods of electrical engineering instruction employed there. He showed that from a general treatment of the whole subject the instruction becomes more analytical as the work progresses. He lays great stress on mathematical theory, preferring, if necessary, to leave the more practical information to be acquired after graduation.—*Electrical World.*

THE TRAINING OF ENGINEERS.—The conference on the education and training of engineers convened by the Institution of Civil Engineers was held on the 28th and 29th of June, and was fairly well attended, there being present at the opening meeting, on a rough estimate, about one hundred and fifty persons. Whither it led we are unable to say. The views expressed were nearly as great as the number of speakers, and very exhaustive analysis will be needed if any definite result is to ensue. One thing, however, seemed to stand out fairly well, and that was that the engineering employer was beginning to kick against the excess of college learning, and to demand other qualifications than the mere ability to take degrees. The wiser professors fully endorsed the engineers' views in this respect, and we may possibly see some modification of the examination system, not only at the colleges and universities, but at the institution itself. Two other points also seemed to stand out prominently—one, that the young engineer, into whatever branch of the profession he proposes to turn, must go through a course of practical training, and the other that, taking one consideration with another, the best foundation for the engineering profession, as for all others, is a sound "literary" education such as is given by our best public schools. We do not know whether this is an indication that the pendulum is swinging back from the modern side, or whether the education given on that side is regarded as sufficiently literary in character, but the view obviously is that specialization at too early an age is undesirable.—*The Engineer.*

THE PRACTICAL SIDE OF TECHNICAL EDUCATION.—In connection with the recent summer meeting of the Association of Technical Institutions, Mr. C. T. Willis read a paper on "The Training of Technical Teachers." What was needed, he said, was a happy combination of theoretical and practical knowledge, the former being kept in reasonable subjection to the latter in teaching. The most successful teachers he had known had been those who had received a fairly good education, had had wide practical experience of their trade, had kept in touch with trade literature, had attended trade classes themselves, and had also attended various classes in science subjects cognate to their trade. Mr. A. Nixon, principal Municipal Evening School of Commerce, Manchester, declared that in the commercial world the cry of "wake up" had done good service. Business men now realized that technical knowledge and ability were essential to the maintenance of our trade and prosperity. For the teaching of this knowledge we required trained teachers of types adapted to the peculiar form of teaching in evening schools. For technical work of a secondary or tertiary nature we must seek the assistance of the non-professional teacher, whose primary qualification must be approved industrial or commercial experience. Principal Walmsley (Southampton) said that for the technical teacher to know his work he must go into the workshop. Mr. R. Roberts, of the London Northern Polytechnic, speaking as an employer, declared that a close application of technical principles could kill technical education. Employers and workmen looked with grave suspicion at this academical side, for they found the men turned out of the technical institution were no good in the workshop. He believed that ultimately the trade of the country would be taught in technical institutions, but if they were to be successful they must not let them fall into the hands of the schoolmasters.—*Page's Weekly*.

THE STUDY OF MATHEMATICS.—The question of the education of boys destined for the army is just now so very much before the public that an article by Lieut.-Colonel C. F. Close, in the *Royal Engineers' Journal*, comes at an appropriate moment. The author, after disclaiming any intention of comparing the relative values of classics and mathematics as a means of mental training, shows that as regards the second of these subjects all that is likely to be required or useful in war is of a very elementary character, while in peace time the chief opportunities for its employment occur in the domains of gunnery construction, engineering, electricity, etc., all important studies, but ones that are not necessarily confined to soldiers. When, however, Colonel Close comes to deal with the second part of his investigation, the conclusions he arrives at are far more interesting. The important question that he puts is: "What is the indirect value to a soldier of an aptitude for mathematics, and what is the indirect effect of a mathematical training on his habits of thought?" To find his answer he examines the education and special aptitudes of the great commanders born in the eighteenth and nineteenth centuries, those chosen being Frederick, Washington, Napoleon, Wellington, Moltke, Lee, and Jackson. From an exhaustive study of the lives of these men, Colonel Close finds that one conclusion stands out clearly—namely, that not one of these commanders had the slightest inclination or aptitude for classical studies, and further that the most impressive positive fact is that Washington, Napoleon, Moltke, Lee and Jackson, and to a small degree Wellington, were all men who evinced to a greater or less extent an aptitude for mathematical studies and calculations. No one with experience of men of action will be surprised at this result of Colonel Close's investigation, and we would wish that its lessons were likely to be more widely appreciated by the modern schoolmaster than is, we fear, the case. In this connection Bacon is worth quoting. He says, "As tennis is a game of no use in itself, but of great use in respect it maketh a quick eye, and a body ready to put itself into all postures; so in the

tineraries. Nor do the training ships seem to have gone to any naval in the United States. Possibly there is good reason for these sions, otherwise visits to foreign naval ports would appear to be ig the more interesting and useful experiences which could be given e cadets.

must be remembered that these cruises are preliminary to appoints to the ships in the fleets and squadrons on active service. They part of the instruction given before the final qualifying examination nidshipman, and during the cruise the lads are not only practically t seamanship, engineering, and navigation, but undergo drills and ises, and to a large extent conform to the ordinary routine of the It is most encouraging to learn both from the reports of the officers ged in imparting instruction, and from Sir Alfred Ewing, the direcf Naval Education, that the system has given even better results were anticipated. Of course, the system of training ships for cadets t confined to the British service. We are familiar with the presence erman training ships in our ports, and the little *Fylgia*, the Swedish ing ship, is often in our waters and was present at the Coronation ew. Recently also, the American Naval Academy Practice Squadron een at Queenstown and also visited the Baltic. It is interesting to are the difference between the American method and our own. The of British cadets sent in one cruiser seldom exceeds fifty, but no than 500 cadets are said to have come over in the three battleships h form the Naval Academy Practice Squadron. Moreover, the er part of the officers on duty at the academy appear to be drafted e ships for the cruise, so that the studies in the institution must be ically at a standstill. Whatever may be the system chosen, there can o doubt about the value of the cruises in these schoolships, when the gsters obtain an early acquaintance with the practical work in a manar.—*Army and Navy Gazette.*

IE USE AND ABUSE OF INSPECTION.—It has been remarked that society ese days is rapidly becoming divided into two classes—the inspectors the inspected. Engineers especially realize that there is a great unt of truth in this saying, as few orders are placed nowadays for neering plant or materials which do not stipulate for inspection. This s to become stricter every year, owing to various reasons, the chief g that manufacturers in selling their goods are now generally bound n both in price and time of delivery, the former being so low and atter so short that mistakes are more liable to occur than was the in the old days, when the manufacturer could ask and obtain his own and could take his own time. In those days the buyer often had to what the manufacturer gave him, and was glad to get it at almost price. But now the buyer knows quite well in most cases what he s, what price he ought to give, and exactly what he ought to get for price, and his main object is to see that he gets it. It follows, therethat buyers have come to the conclusion that their interests will be served by employing inspectors empowered to visit the works of the actors at all reasonable times, without notice, and to follow the se of the order through the works, testing the materials and the ed work, and checking quantities, weights, etc.

ere is, of course, no attempt on the part of firms of good standing erately to defraud their customers. But at the same time manufacrs cannot afford to do more than keep to the bare specification, and fications are often interpreted differently by buyers and sellers. n, again, the heads of a firm cannot always attend to every detail, foremen and workmen will often scamp work, either because they on piecework, or merely to save themselves trouble. In the matter of e rivets in steelwork, blowholes in cast-iron pipes, and such-like small mportant defects, the inspector cannot lay the blame on the manager oreman unless the flaws are numerous. But it is his business to find

these flaws out, and if he discovers a number and sees them put right in the early stages of an order, he will find that the workmen will take more care afterwards. Again, mistakes are frequently made in dimensions, and many firms have no system of checking their finished products, even when the matter is left in their hands.

A good inspector, dealing with large quantities of materials, will save his employers many times his salary in the course of a year. But, to gain the full benefits of inspection, a good man must be engaged. An inspector cannot be an expert in everything, but he must have a very clear idea of the difference between good and bad work, and must be able to read drawings easily. Then an inspector must be firm and able to hold his own, but at the same time tactful, and his honesty must be above suspicion.

An inspector with the above qualifications, and who is also the equal socially of the managers of the works he visits, can do a great deal for the firm which employs him. At the commencement of a contract he goes through the specification and drawings and clears up any doubtful points, both with his own firm and the contractors. He also informs the contractor what kind of work he expects to get and what processes are to be employed on the various details; for instance, it is often left to the inspector to say whether holes are to be drilled or punched; whether plates are to be sheared or planed, rods and bolts solid or welded, etc. When the work commences the inspector will test the materials and see that no unavoidable delay takes place at the rolling mills, and will then follow the work through the contractor's shops and see that the various processes are carried out as specified, or as he wishes, and that the finished work comes together correctly, is of the proper dimensions, and, if necessary, is properly marked for re-erection.

If he is a tactful man and knows his business, he can get the contractor's manager and foremen to agree to his suggestions and requirements with very little trouble, and to push his work on as quickly as possible, and in the case of any alteration he acts as a buffer between the buyers and the contractors.

There are, however, a number of independent inspecting engineers who will offer to take inspection work at extremely low and insufficient rates. They can only do this by employing very young and badly paid men to do this work for them, or else by giving half the time to it that they should do. It may be taken as an axiom that in the majority of cases cheap inspection is worse than no inspection at all, as it relieves the contractor from liability without giving the buyer a sufficient guarantee that the work is properly carried out. There is, of course, certain work which can be attended to by an inexperienced inspector just as well as by an experienced one, but, as a general rule, when work which has been cheaply inspected turns out satisfactorily, it would have been just as satisfactory if it had not been inspected at all.

This brings us to the question of the abuse of inspection, about which manufacturers have a great deal to say, although it affects the buyers more than they are perhaps aware. An inspector may be very conscientious, but either through want of tact or experience, or both, he may be the cause of endless trouble between buyer and seller. Such a man walks into a works as though it belonged to him, calls the manager and foremen over the coals for the slightest cause, treats them openly as though he believes they are deliberately trying to cheat him, persists in sticking to the exact letter of the specification, and rejects quantities of material for little faults which do not matter in the least. The result of all this is that he is disliked wherever he goes, his work is delayed, and people who would not do it otherwise try to get the better of him in order to get him into trouble. Besides this, contractors who have had experience of an inspector of this kind make allowance for him in their next quotation and ask higher prices.

nnecessarily strict and minute inspection is not, however, always due he inspector, as his employers may tie him down to the specification, practically refuse to allow him to use his judgment at all. Certain sulting engineers are very strict in this way, and are so well known extra prices are always charged to cover their inspection.

nother abuse of the inspection system is to send an inspector to see small quantities of material; we have known many cases in which inctors have travelled long distances to inspect, perhaps, 1 cwt. of ordi quality steel, the cost of the inspection coming to two, three, or four s the cost of the material. The government departments are probably worst offenders in this way, the total cost of some of their small rs being out of all proportion to the value of the material or the use hich it is to be put. Considerable delay is often caused, also, by ng these small orders inspected, as the inspector may have to wait before he can visit the works, owing to pressure of more important k, and favorable opportunities of forwarding the material along with r goods are thus missed. Moreover, if the material has to be tested, nspector may have to pay two visits to the mills, one to select and p the test-pieces and another to see them broken, as the mills cannot ys prepare the test-bars the same day.

o sum up the whole question: inspection is useful and worth while r certain conditions, but not under all conditions. It pays well to ect, provided the inspector is a firm and tactful man with a good ral knowledge of engineering and inspection, and with an honest and orable character, and provided also that he has plenty of work on orders and is given a fairly free hand and allowed to use his judgt in the interpretation of a specification. In other words, the intor must be a good one and must have plenty to do, and the more ly the work that he inspects the more worth while the inspection.

spection, as a general rule, does not pay when the reverse of these litions is the case: when the inspector is tactless, of weak character, out workshop experience, or badly paid. It does not pay to be very t on small variations from the drawing or specification which do not t the quality of the work, nor to send an inspector to pass every ll order, unless for special material. It is also a question whether it s to inspect cheap materials, such as bricks, tiles, earthenware pipes, ng, etc. These things are bought in large quantities, and the intor usually sees them stacked in the maker's yard.

he more works a man visits, and the greater variety of materials he ects, the quicker he will be to detect bad work, to suggest improvets, and to get orders through satisfactorily.—*Engineering*.

HE NAVAL ARCHITECTS.—All last week was devoted to the jubilee brations of the Institution of Naval Architects. There were recep s, a banquet, a concert, luncheons, river trips, garden parties, etc., re, and there was just sufficient work to bring together those who e seriously minded for a few hours a day to consider professional tions. The long program was traversed without a hitch of any kind, the excellence of the arrangements throughout won for Mr. Dana his staff, on whom the bulk of the work fell, the heartiest praise in quarters. It was such a jubilee as no other institution has had. It honored by the presence, on the opening day, of the Duke of Conght, and, if we may say so, still more by the presence of men from corners of the globe who have won illustrious names in shipbuilding, he management of ships in war and peace, and in general engineering science. The papers, too, which were presented were not of the inary nature, but were specially devised to suit the occasion. Sir liam White fittingly opened with an address which gave the history the Institution during the fifty years of its life, and he was followed authors who dealt with progress in special directions during the same

Lord Charles Beresford, who opened the debate, dealt with the *personnel* of the modern British warship, which, in his opinion, whatever the quality of the equipment provided, was the most important factor of all. He regretted, as was pointed out by Sir Henry Oram, that the year 1910 witnessed the introduction of a new system, and that we had seen the last of the old arrangement under which engineer officers passed into His Majesty's service. In his opinion nothing could have been better than the working of the engineers' department under the old method. He would like, however, to ask if Sir Henry Oram were satisfied with the present proportion of officers to men. It would seem from the figures given in the paper that while with the increase in the requirements of the service the number of men had considerably augmented, the number of officers remained about the same. He would point out that the responsibility resting on the officers had greatly increased, and the figures showed that in the Japanese Navy the proportion of officers to men was higher than in our own navy.

Admiral H. I. Cone, U. S. N., questioned whether the combined system of reciprocating engines and turbines, or geared turbines, or, indeed, any of the proposed methods for improving the efficiency of the turbine at low speeds were worth the extra complication involved.

Mr. Borowicka (Austria) said that those responsible for the designs for the Austrian Navy had not looked with favor upon the combination system, but that attitude was partially explained by the fact that Austrian ships of war did not have to make the long voyages to which the English fleet was accustomed. For their special requirements they found that the fitting of cruising turbines for low speeds was sufficient.

Mr. W. M. McFarland said that the trials of the collier *Neptune*, which had been fitted with geared turbines, were now being carried out. Information as to the results of those trials in United States waters was not yet available, but he was able to say that on a preliminary trial extending over forty hours, at 7000 horse-power, with these turbines, the efficiency figure obtained was 98 per cent.

Mr. A. E. Seaton agreed with what had been said on the subject of British war vessels being in some respects undermanned. The present complement might be sufficient for times of peace and cruising conditions, but was not capable, he believed, of working the ship in war.

Professor A. Rateau commented on the rapid development of the employment of the Parsons turbine. The curve of horse-power built as shown in Sir Charles Parsons' paper was rising at a very rapid rate. This satisfactory result was due not only to the invention itself, but also to the persistency of the inventor. He would like to point out that the installation in the *Velox* was different from that in the boat fitted by Messrs. Yarrow, or that in the destroyer *Chasseur*. In the one case the engine was coupled direct to the shaft, while in the other separate shafts were employed. He noted that Sir Charles had classified the Rateau turbine in Class 4 in his paper, but it appeared to him that it would have been more properly placed in Class 3. It was really of the combination type, and in its application to marine work had always been in that class.

Sir Charles Parsons said that the combination system opened up many possibilities, but it had its limitations, and the lack of elasticity prevented its application to certain classes of warships. There could be no doubt he thought as to the advantages of gearing from many points of view, and particularly for the realization of high efficiency under all conditions. There was no extra space required for the geared turbine, and it presented no disadvantages on the score of cost. He was not in favor of the floating cradle (Westinghouse type); it was sufficient if provision were made to allow end movement of the pinion shaft.

Sir Henry Oram, in a brief reply on the point raised by Lord Charles Beresford, expressed the opinion that the number of officers and crew provided for the *Neptune* was quite sufficient. It should not be over-

looked in making comparison with the old system that the artificers, of whom a large number were carried in the modern ships, could be regarded to some extent as being the equal of the old type of engineering officer.

Mr. A. E. Seaton mentioned that thirty-nine years ago he had some Japanese pupils, and he never had a greater pleasure from a professional point of view than in teaching them. Subsequently he had had the pleasure of designing the engines for the first modern Japanese warship, the *Maya*, and also for the sister ship. In those days, although the Japanese were only just beginning to get used to Western habits, they were clever enough to have something better than the British Navy had for the same class. This was the class *Gem*, which had very big cylinders on not very big boilers, and with very hard stoking 12½ knots could be got out of them, whereas the boilers in the Japanese ships gave 14 knots fairly comfortably. The sting of the paper was in the tail, and it required a little explanation. The author said, in the paragraph headed "The effect of War upon Machinery," that some of the Japanese ships in the late war were under steam for 2000 hours continuously, and no noticeable trouble was given. That was because the Japanese were not persuaded into buying cheap things. It was no use offering the Japanese Government anything in lieu of something it had set its mind on because it happened to be a little cheaper. The Japanese Government always purchased the very best articles in the market. The gallant admiral had not said very much about the Japanese mercantile marine, but he had seen illustrations of some exceedingly fine passenger steamers which were equal to anything that we could turn out in this country, judging by the figures. There were also coasting steamers which seemed as near perfection as was possible at present. One advantage which the Japanese had in this matter was that they were not hampered by traditions. They were in the position of being able to approach the subject afresh, and consider everything from an engineering point of view only. If we could only sometimes forget a little history it would be a great deal better for everybody, and a great deal better for the British Navy.

Admiral H. I. Cone (United States Navy) said there were some specimens of Japanese merchantment trading with the West Coast of America which were most modern in every respect, being fitted with oil fuel arrangements, etc., and, much to the disgust of the American and British shipping companies, they were taking all the traffic.—*The Engineer.*

AEROPLANES IN NAVAL WARFARE. *Reconnoitering—Use in Coastwise Signaling.*—It is evident that reconnoitering will be the main sphere of action for aeroplanes. Just like the dirigible it will be possible in certain cases for the aeroplane to supplement the signal and information service on land with more or less reliability.

If we take as efficiency a time of flight of four hours and a speed of 80 km. per hour, it is possible for an aviator sent out from the coast observation station to reconnoiter large regions of the Baltic Sea. France has also tried successfully to equip the aeroplanes with wireless telegraph outfits. But this can mean instruments for short distances only; and in the future, we will probably not be able to count on any far-reaching wireless equipment on account of the weight. The resulting information will therefore be known only after the return of the aeroplane, as is not the case with airships. When we consider the great speed with which the aeroplane travels, such reports will still be very valuable. As a distinct advantage of the aeroplane we must consider the fact that it can approach the enemy within a comparatively slight distance in order to take observations, since the aeroplane offers a very small target, so that it need not fear hostile shells.

As regards spotting of submarines and mines, the same holds true here as with the airship, with the addition that an accurate determination of

locality is even more difficult for the aviator in the aeroplane than in the airship.

Use for Reconnoitering in Connection With a Fleet.—On the other hand the work of reconnoitering in the service of the navy is reserved to the aeroplane. An example will illustrate the importance of such a service. An enemy blockading the mouth of the Elbe River wishes to know where German ships are anchored, in order to move light bodies of troops at night. An aeroplane sent out just before darkness will give good service. Again, the reconnoitering ships of both sides meet in battle. Authoritative information seems out of question, although information as to the strength of the hostile force is essential. Again an aeroplane will be useful. So far the transmission of orders and reports, the aeroplane can be employed with great usefulness, from shipboard to land and from one slip to another, as for example, in connection with separate squadrons of a fleet; and finally for communication between land and shipboard.

In this use we have the further question of possibility of flight and landing on board ship. With a good road and start into the wind the aeroplane can rise with an initial start of 30 to 40 meters on an inclined plane, perhaps even faster. At any rate it will be possible to find a deck of sufficient length on large ships, which can be equipped for a satisfactory start. At the end of 1910 an aeroplane rose from the rear promenade deck of the German Hamburg-American Line steamer *Kaiserin Auguste Viktoria* near Sandy Hook and carried dispatches and mail to land. In New York harbor similar starts from Hamburg-American Line ships were tried with success. It would be more difficult to find room for such a starting platform on warships where the disposition of the guns is of first consideration. It would be possible, perhaps, to use starting devices similar to those used originally by Wright machines; probably on board with sufficient height for the starting flight a shorter distance will be sufficient than is customary on land since the aeroplane, as soon as its wheels have left the deck, begins a gliding flight, which the influence of the propeller with increasing horizontal speed will change into the normal soaring flight.

The possibility of such a start from a warship was illustrated by the successful trial of the American aviator Ely, who toward the end of 1910 flew to land from the American protected cruiser *Birmingham*. More difficult than this problem will be alighting on such a limited space as is available on board ship. But this problem also was solved in January, 1911, by Ely, although such special arrangements had to be made on the American cruiser *Pennsylvania*, as would be impossible in actual warfare; on the rear deck was an inclined wooden track of 40 meters length and 18 meters wide and a receiving device for the aeroplane. But this could be avoided by having the aeroplane descend on the water and then raise it up on board as one would raise a boat. For this purpose either the frame or the planes must be made to float or special floating runners must be used, which, however, would have the disadvantage of causing a special air resistance. Whatever it may be, aeronautics has already surpassed greater obstacles than these. It is very likely that a competent solution will soon be found. For only with this point in view is it possible for the French to have made steps to introduce aeroplanes in the navy, and they intend to equip land stations and special ships in this way. An old cruiser *Foudre* is being rebuilt for this purpose. It is no wonder that they made the start, in view of the advance standing which they enjoy in the realm of flying. The Americans will probably follow in the near future, for several years ago, the War Department announced a high prize for an aeroplane which can start from shipboard and can alight on the water. A Curtiss aeroplane has fulfilled the most essential requirements in January, 1911, in San Francisco, by rising from the water and alighting on the water. This aeroplane had cigar-shaped floating

runners. All this shows with what zeal America tries to make the aeroplane useful for naval warfare. Since the German budget has also means for tests with aeroplanes, it is to be hoped that this will be a further spur for all interested parties, to bridge over the gap, which separates Germany in this line from the other two nations.

Other Possible Uses.—As a last point we must view offensive possibilities of aeroplanes. We should consider that an aeroplane to be used above the sea, should have a great safety factor of operation and great duration of service, so that it may again reach its home destination in safety. Great safety for operation requires great weight, endurance in operation demands a large supply of benzine and gasoline. Moreover, a second person should ride along as observer and for the navigation compass and navigating instruments will be necessary. There is little space left for conveying any means of attack, save with a few light hand grenades, or similar explosive projectiles, which at times may be effective against torpedo-boats, submarines or dirigible balloons. But on the whole the aeroplanes will always lack any noticeable offensive power for naval warfare. In addition to this we have the difficulty in hitting a target when throwing missiles during the rapid flight.

The aeroplanes are and will be useful mostly for reconnoitering.

We do not intend to assert that aeroplanes are at the present time adapted to all the uses mentioned, but that the present state of development gives hopes that these will be reached within a short time. Then it will be time to test them in practice.—Extracted from an article by "A German Naval Officer" in the *Scientific American.*

NAVAL AVIATION. By Capt. W. Irving Chambers, U. S. N.—A short time ago, when flights were made in perfect weather only, the navy regarded aviation with complacency. Now that the greater possibilities of flight under average weather conditions have been demonstrated, a majority of our officers are eager to have a hand in the development of aviation for naval purposes, and the fascination of aerial navigation now appeals so forcibly to the spirit of daring in our young officers and men, that our chief difficulty in the future may possibly be so to temper their enthusiasm for flying as to insure the performance of other more necessary and more important duties with the usual degree of efficiency.

I have not the least doubt that these fine young fellows would soon be capturing altitude and other records if allowed to do so, and that to advocate conservatism in aviation now, in the face of its present popularity, will seem almost heretical to them.

But a certain amount of conservatism, at least in the naval branch of aviation, is imperative, and, as aeroplanes are quickly made, it seems to be sound policy for the navy to make haste yet a little slowly until the machines are better adapted to our special needs or, at least, until we have a sufficient number of aviators trained to use them and to measure their efficiency under service conditions.

A conservative policy is evidently that of foreign navies also; but it is known that France has already two naval aviators and one naval aeroplane, that the English Navy has two naval officers under instruction through the courtesy of the Aero Club of Great Britain, and that Italy, inspired by some aeroplane experiments recently made here in conjunction with our ships, is about to develop a suitable machine of the class that we have already evolved in this country.

In fact, although the United States Navy does not as yet actually own an aeroplane, our small beginnings in the development of naval aviation or the practical efforts that we have made within the last six months have attracted the attention of other naval powers, and we will doubtless soon learn of great advances in the improvement of aeroplanes for naval use generally.

It was only last summer that demonstrations of air flight in this country made it seem probable that aeroplanes could be used from a ship. At that time the principal factor in the general development of aviation seemed to be the stimulus afforded to aviators by substantial money rewards for exhibition flights, and Mr. Eugene Ely deserves special credit for cheerfully and enthusiastically entering into the spirit of naval aviation without the prospect of any reward whatever.

Mr. Ely may be regarded as a pioneer in this branch, although it should be recorded that he might not have been able to attempt his brilliant work under the auspices of any other than the liberal, yet safe, management of Mr. Glenn Curtiss.

It was fortunate for us that one school of aviators was ready and eager to co-operate with the navy; for this connection with the Curtiss school led to a series of progressive experiments that have resulted in the production of a naval aeroplane that is almost perfect.

With this machine Mr. Curtiss is able to arise from or alight on either land or water. He can land on water that is comparatively rough. His "Triad" can be hoisted in and out like a ship's boat and, in accordance with plans already perfected by Mr. Curtiss, we will probably soon be able to launch this machine from shipboard without the necessity for any special platform or the provision of any extra gear that may not be rigged or unrigged in a few minutes.

In my opinion, Mr. Curtiss has recently done more for the development of naval aviation than any other man in the world and he deserves special honor for his liberality and foresight.

The usual policy of aeroplane builders is to make the training of military aviators contingent upon the sale of their machines but Mr. Curtiss early adopted the policy of offering to instruct officers of the army and navy in aviation unconditionally, and it is due to this liberality that the navy is ready, now, to train its own aviators, although the money appropriated for independent work in aviation will not be available until the first of July.

The Wright brothers, of whose work the country is justly proud, have also offered to train a naval aviator, and we anticipate the early inauguration of a systematic course of instruction in aviation, entirely under the auspices of the navy, at our own aerodromes, which for obvious reasons it is desirable to have so located as to be accessible to naval vessels.

I regard the development of the naval aeroplanes, or hydro-aeroplanes (the Curtiss type of which has been named the "Triad" from its triple power to function on any of the three elements, air, land or water) as marking an important epoch in aerial navigation.

If ever trans-oceanic flight by aeroplanes is accomplished, I presume it will be due to the further development of this class of machine. By its use aerial navigation becomes a matter of comparative safety and a means of delightful pleasure trips and sporting events over water.

There is now and always will be sufficient talent in the navy to build its own aeroplanes as well as to operate them and to keep them in the van of progressive aerial architecture. But it is a well-known policy of the Department to encourage private industries in the development of war material and, as this policy will doubtless prevail for some time with respect to aeroplanes, I see no good reason for the navy to attempt now to build its own aerial machines. It is hoped, however, that this policy will not prevent the navy from making its own laboratory experiments, conducting its own scientific investigation of the problems of aerial naval architecture and engineering and establishing a sound system of standard tests for workmanship. It is also hoped that this policy will not prevent the navy from eventually embodying, in its standard machines, the best points of all makes that are specially suited for naval purposes.

From my point of view, the principal problem in future flight is the improvement of the motive power. It is the most important because most difficult. Of course, there will be great improvements in the details of shapes and materials and in the assemblage of various other accessories, but we would have been flying fifteen years ago if we could have commanded then the same degrees of efficiency and reliability of the motive power that are at our command to-day. It seems to me, therefore, that there should be some recognized and authoritative government testing or comparing station for motors and propellers in order to make effective progress in their development. Suitable facilities for this work already exist in the navy. The motors and propellers for future naval aeroplanes will doubtless be thoroughly tested and compared, both in the shop and during flight, at the Engineering Experiment Station at Annapolis and at the aerodrome in that vicinity. In this way the navy may be able to assist in the desired general development.

As for laboratory work connected with the test of models and the materials that enter into the architecture of aeroplanes, the government model plant at the Navy Yard, Washington, is already well equipped for prosecuting scientific investigation in this direction. There we have suitable delicate recording instruments, a corps of expert woodworkers or model makers and draftsmen under the direction of mathematical experts, and all under the disciplined organization of the Navy Department, ready to undertake the work almost immediately.

I anticipate that, by the introduction of aviation in the navy, we will be able to develop substantial improvements in certain necessary instruments such as the aeroplane compass, for example, and that we will be able to add something of value to the science of meteorology. Those of us who were brought up in sailing ships realize that our dependence on the wind and weather sharpened our weather instincts. Aerial navigation will doubtless develop in our future naval airmen a yet keener appreciation of weather indications, through their greater dependence on them, and the meteorological observations of these men will doubtless be recorded systematically.—*Scientific American.*

BOOK NOTICES.

"Marine Engine Design." By Edward M. Bragg, S. B., Assistant Professor of Marine Engineering, University of Michigan. (Published by D. Van Nostrand & Co., New York. Price, $2.00.)

Most text books on marine engines deal only in a general way with the subject of design: no matter how extensive the work, nearly all the space is taken up with descriptions and illustrations of various types. On the other hand those on "Machine Design" cover a broader scope than is intended in this one.

A text-book on machine design should treat of the application of the principles of mechanics to the design of parts, it is a study of the application of scientific principles to all branches of engineering practice. But in many cases the forces acting are necessarily unknown, and appeal must be made to the precedent of successful practice or to the judgment of an experienced man. The multiplicity and complexity of the problems which arise are such that a complete treatise on this subject is too general for those who deal with marine engines only. This book takes up the subject of marine engine design and should prove more readily available for the use intended than any other now on the market.

A marine engineer, even though he is not taking up the subject of designing as a specialty, will be more efficient as an operator if he understands the principles of design.

In general there are two considerations of prime importance in designing engines: I. Adaptation. II. Strength and stiffness.

I. Adaptation requires that each part accomplish the desired result in the most direct way, and with the greatest convenience to the operator. The book gives up-to-date practice in this, the following extract will illustrate, page 43, under "cylinder covers." "The studs should be placed far enough apart to allow a wrench to be used freely, and near enough together to make the joint steam tight. For the sake of convenience and simplicity, it is usual to calculate the studs which should be used for the high pressure cover, and then to use the same size of stud upon other cylinder covers increasing the spacing as the steam pressure decreases."

Usually the size of the engine rooms is fixed and the engines have to be designed and the necessary auxiliaries selected and located. This is where the problem of adaptation comes in, more than in the design of the engine proper. There are certain general principles to be followed in the location of valves and auxiliaries and in the lead of pipes, etc., that are often neglected by ship builders. This seems to be beyond the scope of this book.

II. Strength and stiffness. In his ideas the author has followed up-to-date practice. He bases his calculations on the laws of mechanics and the known qualities of constructive materials wherever possible. In certain cases standard proportions or empirical rules are used. A knowledge of pure and applied mathematics is presupposed. The scientific formulæ are easily deduced from mechanical principles but some times they are taken without any reference as to how they were obtained, making it difficult to see the author's course of reasoning.

In other cases, in both empirical and scientific formulæ, the units of some of the factors are not stated. It is most important, particularly for students, to make it clear why any given formula is used either by indicating how it is deduced or, if the formula be empirical, why it was selected for the particular case at hand.

The design of turning and reversing engines are taken up in the same general way, formulæ and computations for specific cases are presented in a similar manner as those for the design of the main engine.

To sum up:

1. The book should prove readily available for the use for which it is intended.

2. The practice given is modern and up to date.

3. The descriptions are clear.

4. The book would be improved if the reasons for use of each formula were more clearly set forth, it would reduce the tendency of the student to use the formula blindly, and if the scope were increased to include the general arrangement of machinery in the space allotted.

W. B. WELLS.

"Marine Gas Engines, Their Construction and Management." By Carl H. Clark, S. B. Price $1.50 net; D. Van Nostrand Company.

CONTENTS.—*Types of Engines:* Principles of operation of each type. Advantages of each type.—*Two Cycle Engines:* General Construction. Description of some standard types. Pumps.—*Four Cycle Engines:* General Construction. Description of standard types.—*Vaporizers and Carbureters:* Vaporization of fuel. Principles of Operation and description of standard types.—*Ignition Devices:* Principles of ignition. Mechanisms of igniters. Times. Spark coils. Plugs. Batteries. Dynamos and magnetos.—*Ignition Wiring:* Diagrams for Wiring. Spark coils. Distributor.—*Lubrication:* Methods of lubricating the several parts.—*Multiple-cylinder Engines:* Description and construction of standard types.—*Reversing Mechanisms:* Reversing propeller. Reversing gears. Reversing engines.—*Propellers:* Definitions. Efficiency. Measuring Propellers. Calculations.—*Installation:* Foundation. Piping. General considerations and description.—*Operation and Care of Engines:* General Instructions. Hints on finding troubles. Care of engine and outfit.—*Power of Engines:* Horse-power. Formulas for power. Method of finding power. Brakes.—*Selecting an Engines:* General considerations to type, size and construction.

As seen from the table of contents above given, this book does not go into the theory of gas engines at all but is intended only for those who may want to learn enough about them to intelligently select one for a certain purpose and then to run it.

The book is systematic and logical in its arrangement, the principles are first explained followed by descriptions of standard types and their accessories. It is broad enough in its scope for the purpose intended. There are 102 well selected sketches, each of which shows only the detail intended, thus avoiding the confusion usual where one complicated sketch is made to show several details. The descriptions are given in a plain and simple form.

The chapters on "Lubrication" and "Operation and care of engines" are complete and to the point. That part on "engine troubles" should prove particularly valuable to the amateur gas engine operator.

The book contains 115 pages 7½" x 5½" and will be found well adapted to those desiring a brief systematic presentation of the principles and methods of operation and the details of construction of modern gas engines. W. B. WELLS.

"A Short History of the United States Navy." By Captain George R. Clark, U. S. N., Professor William O. Stevens, Ph. D., Instructor Carroll S. Alden, Ph. D., Instructor Herman F. Krafft, LL. B., of the Department of English, United States Naval Academy. (Philadelphia and London, J. B. Lippincott Company, 1911. Pp. 505.)

The authors inform us in their preface that this history of the American navy owes its origin to the "need of a work suitable in scope and treatment as a text-book for the midshipmen of the United States Naval Academy." They add: "Since, in a tentative form, it has been used by them with gratifying results, there is hope that it may prove of interest and value to others whose time for this subject is limited." The book is unreservedly recommended to all teachers of American history in high schools and colleges, and especially to those who have had difficulty in selecting from the large mass of naval facts the information possessing the greatest educational and probative value.

The authors further inform us that the book has been written with certain definite aims, the principal of which are the following:

"First, to present a record of exactly what happened, without personal, sectional, or national prejudice. Second, to regard naval events from the professional rather than the picturesque point of view; for example to emphasize the maneuvering and gunnery in an action rather than the smoke and blood. Third, to suppress the trivial and bring out the important, not neglecting the services of officers in time of peace. Fourth, to give, whenever possible, the original sources, such as letters from secretaries of the navy and official reports of officers." These are all worthy aims, whether for a text-book or a general naval history, and the authors have succeeded in realizing them.

It is especially noteworthy that this book treats of the navy in peace as well as war. To many students it is not clear that the history of the

navy in the one period is comparable to that in the other. Indeed the popular view seems to be that the navy has no history during peace. It is not too much to say that the peaceful history of the navy since 1815 is as important from many points of view as its warlike history during the American Revolution. The reviewer is pleased to note that this volume contains such subheads as "the marine committee," "types of ships and guns," "the founding of the naval academy," "Perry's expedition to Japan," "the period of naval decay," "the birth of the new navy," "the navy in Polar exploration," "diplomatic services of naval officers," "cruise of the battle fleet," and "recent development in ships, guns and personnel." There are a few other subjects, such as the development of the navy department and the administrative services of naval officers, which, if space admitted, might have been included in this class.

In treating of our naval wars, the authors have rightly laid considerable stress on the civil history of the navy, although naturally and properly most space is devoted to naval actions. In respect to the latter it is enough to say that their selection is excellent and that their treatment corresponds with the aims that they have set for themselves and that have been enumerated above. All the important naval actions of our several naval wars are adequately treated.

The authors have rightly given much weight to official reports, concerning which they make the following observations in their preface: "The fighter writes as he shoots—straight to the mark. He may be prejudiced in favor of his own flag, but his account is usually more sportsmanlike than are the corresponding accounts of his countrymen who were not there to see, and has a unique interest that no rewriting ever attains." It is certainly true that a good deal of naval history evaporates in the process of paraphrasing a participant's account of a battle—the actual phrasing on the spot gives off a fine historical aroma. It is also true that the quoting of an author necessitates a mixing of styles and interferes with the unity of a composition. The gain, however, in most cases will much more than counterbalance the loss.

This book contains many illustrations, maps and diagrams, and presents a pleasing typographical appearance. Its list of authorities at the end shows a discriminating reading of many of the sources of naval history. The style is simple and unadorned—entirely devoid of the journalistic claptrap that mars some of the current naval writing, of that cheap extravagant phrasing by means of which showy writers hope to seduce jaded intellects into reading inaccurate history. The volume ends with an index, which seems to be well made.

C. O. Paullin.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

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The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-eighth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1912.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1912. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

W. B. WELLS,
Lieut.-Commander, U. S. N., Secretary and Treasurer.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ABSENCE OVER LEAVE IN THE FLEET.

By CAPTAIN W. F. FULLAM, U. S. Navy.

Absence over leave is so prevalent to-day among enlisted men in the fleet as to seriously injure the discipline and morale of the personnel. If this evil is not checked, and that, too, without unnecessary delay, the efficiency of the service will be disastrously affected.

During one period of five months there were 7150 reported cases of absence over leave among sixteen battleships—more than one case for every two men in the fleet. The average per ship was 447, the maximum was 774 and the minimum 142. Such a record can only be regarded as extremely discreditable; it cannot be passed over without severe condemnation, and the time has come to handle the subject by act and by word in a manner that will command immediate attention and secure immediate reform.

There is not the slightest possible excuse for such a condition. The Navy Department has done all that it could be reasonably expected to do in the interests of enlisted men during recent years, in establishing home ports, granting a free Sunday, and by ordering fleets and divisions to certain ports in order to give leave and liberty from time to time. In fact, the department has been most liberal and consistent in looking out for the welfare and in safeguarding the privileges of enlisted men. Admirals and captains have complied with the general policy of the department by granting the men as much leave and liberty as possible—quite as much

as they have any reason to expect. In many cases the m had more leave than commissioned officers could get.

REASON FOR THE EVIL.

It is not difficult, however, to account for the preval this offense; it is due to the fact that there has never b determined or well-directed effort to put a stop to it. In th Navy" it was viewed with comparative unconcern—it garded as a necessary evil. The Old Navy bluejacket or was not expected to come back on time; if he came bac he did pretty well—he got a mild punishment, was put few conduct classes, confined to the ship as in a penitent three months perhaps, and then granted liberty in a co both mental and physical, which inevitably caused him to the offense. In the "New Navy" it is only fair to say traditions in this respect have been somewhat modified, to l but the change in the treatment, or view, of this offense ha means kept pace with the almost complete transformatio character of the personnel and in the conditions of na The offense is still regarded with more or less indifference old-time systems of punishment by "conduct classes" restrictions of liberty have been too often perpetuated. C classes never did and never will stop liberty breaking. That made things easy for the captain, made it unnecessary for think. He simply said "fourth class three months," a missed the matter. But the men, unfortunately, have don thinking. They have had every reason to think that over leave is not considered to be a very serious offense; and deliberately stay away as long as they choose and whenev choose, coming back when they get ready to take a nom petty punishment or fine, the memory of which soon passes mind.

Punishment by courts-martial as now conducted are o little avail because as a rule the sentences are too mild. A pamby sentence by a court of three young officers who hav themselves been told, and who do not realize that over leave is a serious offense, is not calculated to deter an indep American from taking leave whenever he wants it; and the r of many such sentences to the ship's company on the quart does not deter others from breaking liberty—on the contrar

sentences are an encouragement to liberty-breakers and such "Courts" do more harm than good. Numberless cases of this kind have been noted by the writer. For instance, a man recently overstayed leave nine days, and the court sentenced him to ten days' confinement and to lose $30. The commanding officer remitted the confinement "because the man's services were needed." In other words this man lost $30 for being away about ten days. Many men will gladly pay that price without the slightest hesitation, when they are having a good time ashore or want to stay there for any reason. The publication of that sentence was an inevitable injury to discipline on board that ship. That man, who deliberately stayed away the limit of time, contemptuously indifferent to every sense of military duty and decency, should have been given the limit—thirty days confinement and the loss of three months' pay. The reading of the latter sentence would probably cause some young listeners to gasp for breath, and it might deter them from committing such an offense themselves. Are we to stop punishing men because their services are needed? Are we so helpless as that? It would seem that if the services of a man are of such great value to the ship and to the government, his staying away for nine days should be viewed all the more seriously and his punishment should be the more severe in order to deter him and others from repeating the offense.

Severity of punishment is not cruel in a case of this sort—on the contrary it will usually prove to be a kindness. A jolt in the beginning of a downward career may bring a young man up with a round turn; it may save him, and at the same time it may serve as a splendid warning to others. There are few ways of punishing men nowadays; but all punishment must not be stopped. Bread and water is a simple diet which does no harm, and the contrast with a full ration is rather enlightening. Solitary confinement (provided the term of confinement is not too short) gives a young man a chance to reflect and to realize that he has made a fool of himself at his own expense. If the term is too short, however, the beneficial effect may be entirely lost. The writer has known many cases where punishments which "fitted the crime" have served to put both old and young offenders back on the right tack. Summary and deck courts must work in harmony with the commanding officer, and the latter must lay down the principle in good plain English that certain offenses will not be tolerated; otherwise

the results of such courts will be farcical. An offense wil
considered serious unless it is severely punished.

ENLISTED MEN NOT TO BLAME.

It is not, therefore, the fault of enlisted men that their s
of duty is low as regards absence without leave. They ar
blame. A low standard has been set for them, or they h
permitted to establish their own standard—one or the oth
blame rests elsewhere. Enlisted men will reach the stand
is required of them: if it is set high they will reach it; if
low they will naturally descend to it. It is a case of c
effect. Men in a military service are just what their offic
them—if the latter are competent and determined.

As a result of three years in the training service afloat
years and a half at Newport followed by nearly two year
mand of a battleship I am convinced that the bluejackets
during the past ten years have been of such a high av
intelligence that they could be brought to any standard of
efficiency that is reasonable or desirable. It is only nece
the officers to fix the standard and do their duty in maint
the men will cheerfully recognize the conditions and r
mark every time. If there is anything wrong it is not
men—it is with the officers. The latter are not good discip
or good instructors—one or both. The average Americ
so brought up as a rule that he is not naturally military
ential in his manner, to be sure. But nevertheless it
conclusively demonstrated at the training station that t
are amenable to the highest standard of military drill a
pline. Their personal independence is not prohibitive of
efficiency, because their intelligence is exceptionally good
can readily be made to see the reason for things—they
brains. They are better than men who are more pliable
intelligent. The material is all right. It only needs to be
instructed, strictly disciplined, and fairly treated—that is
young American must be started right—that is the who
of the matter.

Officers have been heard to complain that their men are
tary and not fit for certain duty—and why? Because th
has not instructed them—he has left them to instruct the
It is not commendable for an officer to blame his men fo

ition—he should take the blame himself and hustle to correct ault. At the training station all the recruits on a baseball field stand at attention when the commanding officer approaches. punctiliousness of the apprentices as regards salutes, etc., een a subject of wide comment. On the other hand when we e to the fleet the admiral or the captain may pass along un-ed. Why is this? Simply because the man in the fleet is taught or required to be attentive and military *habitually* but *spasmodically*. Spasms are not lasting in effect.

BAD EFFECTS OF LIBERTY BREAKING.

here is no other offense which has such a far-reaching effect evil in the navy as liberty breaking. It is perfectly plain that onduces to debauchery and to a general disregard of the damental principles of duty—in fact it involves a combination ffenses and it leads men most naturally to a contemptuous view heir obligations to the ship and to the service. On the other d it will be admitted that if men could be made to recognize ll fairness their obligation to return from liberty on time, the ral effect would be for them to recognize other obligations as l. A careful consideration of this matter will convince any er that this offense is more generally serious and damaging in effect upon discipline and efficiency than any other in the gory. Furthermore, the effect is rendered still more serious the fact that our navy is composed almost entirely of young who are still in the formative years of life; we practically e a navy of boys. If we let them get on the wrong tack when are young they may remain there; if, on the other hand, we d them right in the beginning they may stay right; the effect be lastingly good or lastingly bad. This view of the matter st not be forgotten; it is vital. Our duty as officers is perfectly n.

n civil trades and corporations men cannot neglect their duty remain away with impunity. The discipline in civil life, in r words, is vastly better and more severe than it is in the navy his respect. Our men know perfectly well that such conduct ld not be tolerated by any civil employer and that they would their jobs if they were at work on shore; but they soon learn it is the custom or tradition to permit it in the navy, and that will not be discharged until they have been court-martialed

two or three times. In other words the navy permits, practic encourages, a disregard of obligations on the part of men wh would not be tolerated for an instant by the Pennsylvania Railr or any other corporation; we take and keep men whom they wo discharge at once as worthless, untrustworthy and unreliable. long as the navy regards itself as helpless it will remain so. T condition is one of deep humiliation. An instance is on record more than one, in fact—of fifty men being absent over leave at o time from a ship at a navy yard. In another case, during a s of less than two months, eighty men overstayed from one to f days; thirty-two men for five days or over; twenty-seven men o day or less; and seven left the ship without permission—o hundred and forty-six men in all, or about one-fifth of the wh crew. What can we say of a system of discipline under whi such a state of things is prevalent, or is possible?

An unfortunate tendency has been noted of late (and officers a more to blame for it than the men) to neglect matters of discipl on board ship if only the spirit of the crew is such that the s makes a good record at target practice. It is admitted that go shooting is the first essential in the navy, and that the metho by which good shooting was first brought about were demand at that time—a complete revolution was necessary to fix ever body's mind on a matter that had been so sadly neglected. general smashing of routine doings, drills, and customs was abs lutely proper. But now that this reform has been consummat we need no longer ignore matters of general morale and go discipline. It is not necessary to cater to anybody, nor to caj anybody into doing his duty now-a-days—we need not seek create a winning spirit in a ship by letting discipline become l and by telling men that if they hit the target they will be excus from all or any offenses against good discipline. We can have high standard at target practice without a low standard of disc pline. Any man's place can be filled in this world—even in th navy. "The Lord will provide," even when a gun-pointer is p in the brig.

THE REMEDY.

There is nothing more to be avoided by an officer than a tendency to chronic criticism, growling, and fault-finding. He should not inveigh against a condition until he has investigated the matter and found some remedy for the evil which he thinks he has discovered.

or the past ten years the writer has given special attention and oted every energy to the general training of men, and parlarly to this evil of overstaying leave, believing it to be the t important of all things affecting the navy. The following eral plan has been followed both afloat and on shore, and has ved to be conspicuously successful:

1) The men have been given to understand by frequent warns in good plain English, with all hands at muster, that absence hout leave would not be tolerated—*that it would be punished to limit of the law in every case.*

2) Men have not been classed nor restricted to the ship as a ishment for liberty breaking, except when awaiting their turn confinement—all hands have been given leave and liberty, and much of it as possible. Extension of liberty and leave have n granted when the circumstances warranted such extensions.

3) Men not more than three hours over time, who show no ent to remain away, and give some reasonable excuse, get extra y on the quarterdeck under arms from 8.00 to 11.00 p. m.

4) Men more than three, and less than twenty-four hours over e get a deck court, as a rule, though in some cases a summary rt is assigned.

5) Men who are twenty-four hours or more over time get a nmary court.

6) The record of the man is always considered, but the general dency of the courts is to give as severe sentences as the circumnces will justify in all cases, by reason of the liberal privileges owed, and the utter lack of excuse for such offenses.

(7) Bad conduct discharge is given in case of incorrigibles, or en the man's record justifies it.

(8) Acting appointments of petty officers who break liberty are thdrawn, not as a punishment but for "unreliability."

(9) Permanent appointments are revoked by sentence of summry court-martial.

In addition to the liberal rules concerning liberty, every effort made to remove petty, harassing, and irritating delays in getting erty parties out of the ship. As a rule the liberty party is ckly mustered by divisions by petty officers on duty in each ision, and these division parties are marched to the dock, formed line at once, and after counting off by squads the whole party is mptly marched away. It is done in a very few minutes Thus

the men are not kept standing for a half hour or more while a party of two or three hundred is mustered from a long list by the officer of the deck. These are small matters but they count heavily in securing contentment and in teaching men that their comfort is considered. It is neither military nor sensible to handle a large party of men in any other manner, and an executive officer or officer of the deck is not doing his duty if he permits liberty men to stand around on one leg for a half hour until they are tired out or disgusted.

In this connection it is proper to refer to an order now in force by the action of the commandant of the Philadelphia navy yard. Liberty parties marched through the yard in military formation by an officer wearing a sword, with a petty officer wearing a belt at the head and another at the rear of the column to prevent anybody from joining the party or from taking Government property out of the yard, are passed through the gate without being questioned or stopped no matter what the individual men may carry with them. The navy yard is regarded as a bridge over which the men must pass to avail themselves of the liberty granted them by their commanding officer. This order is the best that has ever been framed, and it is thoroughly appreciated by the men. It is only necessary that the officers on board ship shall do their duty and see that liberty parties are kept closed up and are marched in good order as they should be. Neglect in this particular is inexcusable, and it is from such causes that men have been too often held up, delayed, and searched in a manner that is at once inexcusable and irritating.

This combination of liberal and considerate treatment with a strict requirement as to the standard to be reached is fully recognized as fair and square by the men, and the liberty breaker in this ship gets no sympathy. It is a reasonable concession to American character and at the same time it demands of the independent, self-reliant, headstrong youngster a decent regard for his military duty. It is not necessary to coddle our men nor to yield any military principle whatever. It is only necessary to remember that this is the United States when we formulate systems of discipline, and to tell our men in plain words that the navy is a military service and not a farm. The balance between American institutions and military discipline is easily preserved, and it is the duty of officers to study and know how to preserve it.

In this connection it is proper to refer to the liberal action of e Navy Department and the navy generally in recent years, in olishing irons, giving men their money, and doing away with the rmer custom of searching liberty parties at the gangway. These e all concessions to American institutions and American char- ter. It only remains now to make a proper demand of American iejackets—that they, too, shall do their part by properly recog- zing their obligations to the navy and to their uniform. They ll come to the mark when this demand is made in an authori- tive manner. They have transgressed only because the navy has iled to impress them with the gravity of the offense.

THE RESULT.

The result of the system outlined above and carried out for the st eighteen months on board the *Mississippi* has reduced ab- nce without leave to at least *one-third what it would otherwise ve been.* This statement is made with absolute confidence and could be proved by direct evidence were it not for the manifest propriety of giving data obtained from other ships. When the iciency of the navy and the welfare of the enlisted men are volved, however, there should be some means of bringing a bject like this to the attention of the service without danger of ving offense to others, and without subjecting oneself to the arge of self-conceit or improper motives.

The following are some of the results recorded on board the *ississippi* during the past year:

At Gravesend, England, during a stay of three weeks, only neteen men returned over liberty; six of these were only two or ree hours late, and only four of the whole number were absent enty-four hours.

At Brest, France, during the stay of three weeks, twenty men turned over liberty, ten of these being less than three hours late d only three being twenty-four hours over time. Not a single an overstayed *leave* during the cruise abroad, although hundreds ent to London and Paris. There were two deserters—a sus- cted thief, and an Italian musician.

From May 8 to June 4, 1911, at Pensacola, Florida, where neral liberty was given, eight men overstayed, only three of these r twenty-four hours.

At Hampton Roads in April, 1910, 519 men were given liberty, and thirteen overstayed—one ordinary seaman, two coal passers, one ship's cook, one musician, one mess attendant, a bugler, and six marines. Not a single petty officer overstayed, and only one man of the seaman branch.

At the Philadelphia navy yard from September 7 to September 25, 1911, inclusive, fourteen men overstayed liberty for more than three hours, and only five of these for more than twenty-four hours or longer.

The above is a fair statement of the results obtained under this system. It is proper to state in this connection that it has only been by the constant and unremitting personal attention of the commanding officer that the plan has been a success. A large percentage of the offenders during the past six months have been comparatively new men transferred to this ship to fill vacancies in the complement—men who have been accustomed to some other system. It is not easy for one ship or a few ships to combat an evil of this kind—the whole navy must pull together in a determined manner in order to accomplish a reform which is demanded at once and which should not be delayed. The assertion is ventured that the number of cases of absence without leave can be reduced to one-fourth what it is at present by a firm and consistent system based upon a clearly worded general order that this offense must not be tolerated, and that all offenders shall be severely punished. An additional provision should be made—every man who absents himself for four days should be tried by a general court-martial within twenty-four hours on board his own ship, and sent to Port Royal for at least six months. There should be a court for such purposes on board each ship, and action should be swift and sure.

There will always be a certain number of incorrigibles, but if these men are promptly discharged or sent to Port Royal the number of offenders will soon be greatly diminished, enlisted men generally will settle down to a contented recognition of regulations which are fair and just, debauchery and demoralization will largely disappear, and a system which in the light of the past might appear arbitrary and severe will prove to be simply elevating and beneficent in that it will save many a man from a b[illegible] bringing him to recognize duty and decency. Procrastin[illegible] disciplinary matter of such importance to the navy will [illegible] inexcusable; the time has come to do something.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE BOARD OF NAVY COMMISSIONERS.

MMISSIONERS FOR EXECUTING THE OFFICE OF CONSTITUTIONAL COMMANDER-IN-CHIEF OF THE NAVY OF THE UNITED STATES.

By REAR-ADMIRAL S. B. LUCE, U. S. Navy (Retired).

\mong the most important and responsible duties which can olve upon the naval officer is that of principal adviser of the :retary of the Navy on all professional questions. The office nes to him, or should come to him, when his judgment has been ened by the varied experience of more active employment, and nowledge enriched by an intimate acquaintance with the needs l all the practical details of the service afloat. The prestige ich comes with high rank and the command of a fleet will 'ays prove a valuable asset. Such, in the main, were the Navy mmissioners from 1815 to 1842. They had never commanded :ts, for the simple reason that it was not the policy of the vernment of that day to create fleets; but they brought to the ce the rich experience gained in war—the War of 1812. Such re Commodores John Rodgers, David Porter, Stephen Decatur, illiam Bainbridge, Charles Morris, Lewis Warrington and iers. Three Post Captains, the highest rank of that day, con:uted the Board of Navy Commissioners, with the Secretary the Navy at the head. It is conceded that the navy has never :n in such a high state of efficiency as when under the Navy mmissioners (see Annual Report of Secretary of Navy, 1885, ;e XXVII). In abolishing this board and substituting indeıdent bureaus, it was argued that it was only a change of name m Navy Commissioner to Chief of Bureau, and that the Secre- of the Navy would still have the advice and assistance of the ne class of experienced officers. Thus the Board of Navy Comsioners of 1841 was composed of Commodores[1] Charles

[1] Captains in command of squadrons, or naval stations, were given the ', by courtesy, of Commodore.

nnot take rank as a naval power." Too true! Towards the last the "old navy" the decline had been so rapid that under the neful influence of bureaucracy we had, in 1889, actually ceased be a naval power! No stronger argument against our present stem could be advanced than this one fact!

In 1881 a few far-sighted officers sowed the seed in good ound which germinated, and, in time, brought forth the abunnt harvest of a fleet of battle-ships, the first in our history. The estion is now as to the necessity of bringing the old navy departnt up to the requirements of the "new navy," so called.

It has been asserted, and with some show of reason, that a val officer of rank and experience should be placed at the head the navy. President Madison offered the position of Secretary the Navy to Commodore Rodgers, who declined the honor. gain in 1818 the office was offered him, and again declined. esident Tyler offered the secretaryship to Captain Robert F. ockton, U. S. N., who declined it. The practice of the English vy in this respect has been pointed to as an example that might ll be followed. This position is wholly untenable. The First rd of the English Admiralty, equivalent to our Secretary of the avy, is taken from civil life; but whereas the former has a seat Parliament and can advocate in person on the floor of the ouse the adoption of a given naval policy, the latter has to comunicate with Congress in writing which very few read. The nglish Admirals who a century ago became First Lords were, r distinguished services, elevated to the peerage, and in conseence took their seats in the House of Lords, or were elected their constituents to the House of Commons. This gave them luable experience in public affairs and an intimate acquaintance ith the leading men who controlled the foreign policy of the ate, advantages denied American naval officers. Of this class re Admirals Lord Anson, Sir Charles Saunders, Sir Edward awke, Lord Keppel, Lord Howe, the Earl of St. Vincent, Lord rham and others. Each and all had been created peers for tinguished services in their profession before being called upon preside over the affairs of the English navy as a Minister of ate; or had a seat in the House of Commons. But naval officers not fitted by training or habits of thought for making good nisters of State. This is well illustrated by the experience in gland. Following the execution of Byng, March 14, 1757,

Pitt during a heated debate severely criticised Admiral Lord Anson, "the late First Commissioner of the Admiralty." But later, when the storm of passion had subsided, he spoke of him as "the greatest and most respectable naval authority that ever existed in this country. . . . To his wisdom, to his experience and care the nation owes the glorious naval successes of the last war. The facts laid before Parliament in the year 1756 so entirely convinced me of the injustice done to his character that in spite of the popular clamors raised against him . . . I replaced him at the head of the Admiralty, and I thank God I had the resolution to do so."

Coming, as it did, after mature reflection, and considering its source, this is certainly high praise. But "Chatham's posthumous eulogy," according to Captain Montagu Burrows, R. N., "is more than offset by the opinion of a sensible man like Lord Waldegrave." "Lord Anson," said he, "was in reality a good sea officer, but nature had not endowed him with those extraordinary abilities which had been so liberally granted him by the whole nation." This judgment, observes the author of the "Life of Lord Hawke," has been confirmed by the great authority of Lord Stanhope.

The Earl of St. Vincent, in a letter to Lord Keith announcing his (the Earl's) appointment as First Lord of the Admiralty, writes: "How I shall succeed remains to be proved; I have known many a good Admiral make a wretched First Lord of the Admiralty"; and it is supposed, and with reason, that he alluded to his predecessors whose names we have given. St. Vincent himself proved no exception to the rule. Sir James Graham, a civilian, who had served in two administrations as First Lord of the Admiralty and who was evidently partial to naval officers in general, said: "I regard Lord St. Vincent as one of the greatest of our naval heroes, and, in his own element, almost unrivaled in history. I have read the debate, when Lord St. Vincent was First Lord of the Admiralty, in which Mr. Pitt, after the peace of Amiens, discussed the naval preparations and defences generally of this country, and made a motion for inquiry which Mr. Fox supported, and I find that by almost universal consent at that time Lord St. Vincent's administration at the Admiralty was condemned, he being certainly in his own element one of the greatest of naval commanders."

ınd yet, notwithstanding all the animadversions, it may be hfully affirmed that the improvements inaugurated by Lord Vincent when First Lord of the Admiralty in 1801-4 laid the ndation of the triumphs of Lord Nelson in 1805. "Lord St. cent, whose ideas on naval strategy were clear and sound, .igh he did not use the technical terms of the art, discerned provided against the very purpose entertained by Bonaparte a concentration before Boulogne by ships drawn from the ıntic and Mediterranean." [2]

)f Admiral Lord Keppel it was said that, when First Lord of Admiralty, he allowed his personal animosity to Lord Rodney get the better of him so far that he recalled Rodney from the ımand in the West Indies in "a manner the least considerate most summary that can well be imagined." It so happened that order for his recall from the West Indies crossed the despatch ring Lord Rodney's account of his victory of April 12, 1782, r the French under de Grasse. It is assumed that such pro- sional jealousy would be out of the question with a civilian st Lord. However that may be, it is conceded that in the glish navy, at least, the weight of evidence is decidedly in or of a civilian to preside over the navy; but it stands to son that such civilians must have professional counsellors. John Barrow, Secretary of the Admiralty during many years, l author of the lives of Lords Anson and Howe, in treating h great ability the question whether naval men or civilians ke the best First Lords, finds in favor of civilians, and Captain rrows, R. N., in his "Life of Hawke," asserts that: "It will be found easy to dispute his position"; but he adds the pro- o: "If you can get the right kind of naval man for First rd, put him in." Sir John Barrow sustains his views in favor a civilian First Lord, first in the certainty that naval First rds will show a partiality to those who have served under m, and secondly, their want of the general knowledge neces- y for a mixed position, half naval, half civil. The civilian st Lord assisted by naval men is his ideal; and the custom of cessive administrations has followed that direction.[3] He might

Mahan: Sea Power, French Revolution. See also "Naval Administra- ." by Sir Admiral Vesey Hamilton, R N., p. 14.

Sir John Barrow was appointed Secretary to the Admiralty in 1804, re he served with slight intermission for forty years, and under twelve erent naval administrations.

have added that naval First Lords are not always above wreaking their vengeance on their enemies of the profession, as in the case of Admiral Lord Keppel.

The queston of having a naval officer for Secretary of the Navy may be dismissed forever from the public mind.

From the experience of the greatest naval power of the day we are led to conclude that a civilian Secretary of the Navy assisted by a board of naval officers is the main point in a naval administration that will stand the test of a great war; all the rest being subsidiary.

It is the duty of the Commander-in-Chief afloat to do the best possible, under instructions from headquarters, with the forces and facilities given him; but it is the duty of the naval administrator (the Secretary and his advisers) to see that that force is adequate to any occasion that may arise. On him devolves the duty of utilizing the resources of the country to the best advantage; of keeping the fleet well supplied at all times with men, provisions, and supplies of all kinds and munitions of war; and of devising such military measures as may most directly tend to the successful termination of a war. As in time of war there may be, and probably will be, two or more fleets or squadrons operating in different spheres of the theatre of war, not only their general management but their concert of action demand that at the directorate there shall be professional abilities of the highest order. The Trafalgar campaign may be cited once more, not as on former occasions, for its lessons in strategy; but, this time, as an example of the vast and responsible duties which, in war, tax to the utmost the efficiency and resources of a given form of naval government. The problem presented to the English Admiralty was to prevent the invasion of England by Napoleon. To this end Admiral Lord Keith with eleven ships of the line was stationed, at one stage of the campaign, in the Downs to watch the Texel and the Straits of Dover. Cornwallis, blockading off Brest with from twenty to twenty-four ships, formed the center of the British line. Pellew, off Ferrol with eight ships, watched the combined fleet of fifteen. Collingwood was off Cadiz with eight ships. Nelson was off Toulon with twelve ships. In the West Indies were four ships of the line. All these varied stations were linked together by a chain of from one hundred to one hundred and fifty smaller vessels. The positions and strength of

ese various detachments were changed from time to time as the igencies of the war required.

The blockade off Brest won the admiration of the world for rigidity and constancy. As to supplies, Admiral Pellew wrote: can assert with confidence that our navy was never better and, that it was never better supplied, and that our men were ver better fed or better clothed." Here we have an ample idence that the commissariat—the civil branch of the Admiralty was thoroughly efficient, and the successful issue of the camign, due to the skilful disposition of the ships, furnishes abunnt proof that the military branch was equally efficient; and rther, that the two parts worked in harmony, as one wellganized body. In short, the British Admiralty stood the test a great war. It is a wonderful and instructive story of efficient val administration—this Trafalgar campaign.

The readiness and the ability to devise a strategic plan of erations in advance of hostilities is one of the first essentials a sound system of naval administration. An able military iter of our own day, in advocating a close study of war as a ence, remarks that:

> We want to know, not only the best means and methods of conducting the various operations of war, including the preparations therefor, but b, as far as possible, to clearly perceive all the conditions of the problem war; to be able to analyze and combine those conditions; to estimate the racter of the work to be done and the means necessary to attain that l; to measure, accurately, the means at our disposal, the best practile method of combining them, and the results that we may reasonably ect to accomplish. In short, we want to be able to determine whether iven war problem is susceptible of solution by any means at our disal; or, given the problem, to determine what are the means necessary accomplish the desired end, and in what manner they must be used.

The study of such problems belongs to the naval administration, Secretary of the Navy, assisted by his staff of thoroughly ined naval experts. On his efforts in making timely preparas depends largely the final success in war. A very striking stration of the evils flowing from a want of such knowledge the part of the administration, of the incapacity to determine ether or not a given war problem is susceptible of solution, is nished by the case of the attacks on Charleston, S. C., ordered the navy department during the Civil War. A competent al administration would have seen that the problem, viz., the

capture of Charleston by the Monitors alone, was insoluble w
the means at hand, and hence would not have demanded the i
possible.

In these days of "scientific management" it is assumed, a
matter of course, that hereafter no officer will be assigned to d
as a military and naval adviser to the Secretary of the Navy v
has not enjoyed the advantages of special training at the N
War College for that particular kind of service.

From the foregoing it is clear that naval administration inclu
two separate and distinct parts, each one indispensable to
other: the military and the civil. The "employment of ves
of war," to quote the language of the Act of 1798, establish
the Department of the Navy, comes under the military head;
"construction, armament and equipment of vessels of war"
long to the civil branch.

"My brief experience in this department," to quote from
Secretary of the Navy's report of Nov. 30, 1885, "has satisfied
that, whatever changes in its organization may be desired, i
of the first necessity to separate, as much as practicable, the w
of direction and deliberation from the details of execution;
other words that there should be in the construction of the na
as in every other kind of business, a proper distribution of lab

Failure to understand these simple truths in the past is
cause of the miscarriage of the several efforts to organize
navy department on sound military and business principles.

Having explained and illustrated the objects and aims of na
administration, we may now give a summary of the efforts
Congress to devise a suitable form for the government of
navy of the United States.

(1) The Act of Congress of October 13, 1775, establishe
"Marine Committee" composed of members of Congress.

(2) November, 1776, Congress established a "Contine
Navy Board."

(3) The Act of October 28, 1779, established a "Board
Admiralty."

(4) February 7, 1781, General Alexander McDougall w
made "Secretary of Marine" to take the place of the Board
Admiralty.

(5) The Act of August, 1781, provided for an "Agent
Marine" to supersede all former committees. This duty subse
quently devolved upon the "Superintendent of Finance."

August 7, 1789, the navy was placed under the Secretary ·, where it remained nine years. During this period the forty-four-gun frigates, *Constitution* and *United States*, : six-and-thirties *Constellation* and *Chesapeake*, were de- built and launched.

The Act of April 30, 1798, established a navy department, name only.

Act of February 7, 1815, established Board of Navy ssioners.

Act of August 31, 1842, abolished the Board of Navy Com- ıers, abolished the military and executive branch, for which .vy Commissioners stood, and established the industrial represented by bureaus, practically as they exist to-day.

Act of April 30, 1798, establishing the Department of the provided for a "chief officer to be called the Secretary of vy," "whose duty it shall be to execute such orders as he :ceive from the President relative to the procurement of tores and materials; and the construction, armament, equip- nd employment of vessels of war, as well as other matters :ed with the naval establishment of the United States." s to have "a principal clerk, and such other clerks as he ink necessary. . . ." No one could have thought for a t that the head of one of the great executive departments government, a member of the President's cabinet, could ı himself personally with the "construction, armament and ent of vessels of war," or their "employment"; and yet ıe meagre details of this very rudimentary form of naval ment that duty must have devolved upon the Secretary or upon his civilian clerks—as no others were provided

nged in tabular form for convenience of reference, Con- by the Act of 1798, provided for the naval administration United States as follows:

The President (Commander-in-Chief)

The Secretary of the Navy (His Exponent)

ve and Military Branch: "Employment of Vessels ır").	**Civil and Industrial Branch: ("Procurement of Naval Stores and Materials, Construction, Armament and Equipment of Vessels of War").**
Office not provided for.	Void: **No provision for such offices.**

The War of 1812 exposed the fatuity of having the navy managed by a civilian unassisted by professional advisers, or even the means of carrying on the duties of his office.

With little experience of our own in such matters we naturally turned to England for enlightenment. The division of our State powers into executive, legislative, and judicial was taken from England: we adopted the English common law, and our "Rules for the Better Government of the Navy," commonly known as the "Articles of War," were taken in the main from those of England, with certain necessary changes of phraseology. It was inevitable, therefore, that we should look to England for a sound system of naval administration. Congress attempted to do this when by the Act of February 7, 1815, the appointment of three Navy Commissioners was authorized.

To obtain a full understanding of the origin and nature of the office of Navy Commissioner we must go back to the early history of the English navy. On his accession to the throne in 1685 James II declared himself, in council, Lord High Admiral and Lord General, titles subsequently confirmed by Parliament. And well might King James assume those offices. He combined in his own person the characters of an accomplished seaman and soldier. He was a man of business and of industrious habits. He did much for the improvement of the English navy. But he was false to his great trust as sovereign of a free people. He was in the pay of Louis XIV, his country's bitter enemy. This was the most critical period in English history. It was essential to the cause of civil and religious liberty that the English fleet should dominate the "narrow seas." It was an imperative necessity, therefore, that the question of the government of the English navy should be treated with the gravest consideration. Hence the Acts of Parliament: the one first quoted, and those to be referred to presently. Those acts have come down to our own times. They are no more antiquated to-day than are the fundamental truths on which is based a popular form of government such as that of the United States. These high offices, were by our federal constitution conferred on the President of the United States, under the simple designation of "Commander-in-Chief of the Army and Navy of the United States."

Soon after the Revolution of 1688 Parliament decla[red] "*All the powers vested in the Lord High Admiral of*

exercised by the Commissioners for executing the office h Admiral of England for the time being, according to ommissions." When, therefore, Congress authorized the ntment of three officers of the navy who shall constitute d of Commissioners for the Navy of the United States," and he board so constituted shall be attached to the office of the ry of the Navy, and, under his superintendence, shall dis- all the ministerial duties of said office," it is clear that the on was that the Commissioners, in conjunction with the ry, should "execute the office" of the constitutional Com- r-in-Chief of the navy.

ill be seen from this that the term "Navy Commissioner" with precision the exact nature of the office. It was larly well chosen by Congress.

relations between the Supreme Executive Magistrate of d and the English navy in 1688, and those of the Chief ive Magistrate of the United States and the United States o-day, are analogous. We have therefore a precedent of vo hundred years of continuous practice, with few inter- s, as a model for our study.

conditions on this question to-day remain the same as when glish Parliament in 1688 resolved to constitute a "*Com- of Admiralty of such persons as are of known experience itime affairs, that for the future all orders for the man- nt of the fleet do pass through the Admiralty that shall onstituted.*"

eighth attempt to place the navy on a sound basis was made right direction; but, unfortunately, it did not go far enough. one-half, only, of the English plan of organization—the y; but left out the civil offices entirely. It granted the rm of the military body; but withheld the left arm.

n 1 of the Act of February 7, 1815, provided that: "The Presi- the United States be, and he is hereby authorized, by and with the and consent of the Senate, to appoint three officers of the navy, rank shall not be below a Post Captain" (at that time the highest the navy), who shall constitute a Board of Commissioners for the f the United States, and shall have power to adopt such rules and ons for the government of their meetings as they may judge nt; and the board so constituted shall be attached to the office of retary of the Navy, and, *under his superintendence*, shall discharge ministerial duties of said office, relative to the procurement of

naval stores and materials, and the 'construction, armament, equipment and employment of vessels of war,' as well as all other matters connected with the naval establishment of the United States."

The language of the two acts, Act of 1798 and of 1815, it will be observed, prescribes the same duties for the Secretary and for his advisers, the Navy Commissioners. And it was proper that the prescribed duties should be the same inasmuch as the three commissioners were made part of the Secretary's office. Together they formed the executive and military branch of the department—the branch responsible for the conduct of war. They were to assist the Secretary by their counsel in the "employment of vessels of war" and to "execute such orders as the Secretary shall receive from the President." But it left out, as already observed, the civil branch consisting of offices for the "procurement of naval stores, and the construction, armament and equipment of vessels of war," duties which should have been provided for. The Act of 1815 may be tabulated as follows:

The President (Commander-in-Chief)
The Secretary of the Navy

"Executive and Military Branch: ("For the Employment of Vessels of War").	Civil and Industrial Branch: ("Procurement of Naval Stores and Materials, Construction, Armament and Equipment of Vessels of War").
Three Navy Commissioners.	Void: Offices not provided for.

It is obvious from the very wording of the Act that the principles on which naval administration are based had not been fully considered, for while it provided for the military branch it failed to provide for the civil and industrial branch. The "procurement of naval stores and materials" should not have been assigned, as already observed, as part of the duties of the Secretary of the Navy and his Board of Navy Commissioners, still less the "construction, armament and equipment of vessels of war." These latter duties belong to the civil and industrial branch, and it was a fatal mistake to mix up and confound them with the military branch.[4]

[4] Much of the business of the navy department of that day was transacted by naval store keepers, navy agents, and naval constructors. Among the latter were the noted marine architects, Joshua Humphries, Josiah Fox

ie system broke down, as might have been expected. The dy for the defects was sought in the Act of August 31, 1842. the secretariat—the Secretary and the three Navy Comoners—had been left intact, and the civil branch for the curement of naval stores," etc., had been added, we should had a form of naval administration based on sound military conomic principles. From one extreme we now went to the , and applied a remedy that was worse than the disease.

e navy department is the head of a military organization. sole object of its being is the conduct of war, or the preon of war as far as practicable through timely preparation . To deprive the head of a military organization of its milifunctions by leaving the military office vacant was to emas- the entire system and defeat the very object contemplated ongress in the establishment of the navy department. Nor this the worst of it. The mistake in abolishing outright the ary branch was aggravated by investing the civil branch executive authority. When the Navy Commissioners red from the secretariat—the military and executive branch— civil branch as chiefs of bureaus, they would naturally leave d them their military and executive functions to assume civil and industrial duties. But the Act of August 31, 1842, rized the carrying with them to their civil offices their er executive powers, thus invading the prerogatives of the nander-in-Chief. The net results have been prodigality of iditures, wastefulness and efficiency. It insured the lence of the navy.

r earlier failures to organize a Department of the Navy prod from sheer indifference. Up to the time of the War of the navy was so unpopular that it seemed doubtful at one if we should have any navy at all.

e Act of 1815 authorizing the appointment of three Navy nissioners was a wise measure, as we have shown; but it nisunderstood from the first, and by no less a person than ecretary of the Navy himself, whose hands it was intended engthen.

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enry Eckford. The first named was the designer of the *Constitution* of forty-four-gun frigates. But none of these officials formed part of ganization of the navy department.

B. W. Crowninshield, Secretary of the Navy from 1814 1818, decided that all military functions belong to the Secretar exclusively, and that the duties of the Navy Commissioners were of a civil character and had to do with matériel only, or such as were subsequently assigned to the several bureaus. This false conception of the character of the navy board gave rise to much friction. It seriously impaired its usefulness, brought it into popular disfavor, and led to the repeal of the Act.

We are indebted for much valuable information on this point to Mr. Charles Oscar Paullin, who has given us a full and interesting account of the Board of Navy Commissioners. He sums up with the remark that: "Unfortunately many of the problems that the board, by reason of its professional information, was best able to solve, did not fall to it, but to the Secretary of the Navy."[5]

This is a very just conclusion on the part of Mr. Paullin and accounts for the failure of the measure. It was not understood.

The arguments in favor of an Act of Congress giving to the Secretary of the Navy responsible military advisers, such as furnished by the Board of Navy Commissioners, were forcibly presented to the Naval Committee of the House, April 11, 1904, by the Secretary of the Navy of that day, the Hon. Wm. H. Moody. They may be reproduced here as more exigent to-day than when delivered in person to the committee.

SOME BODY TO GIVE RESPONSIBLE MILITARY ADVICE.

[Said Secretary Moody:] Gentlemen: In my last annual report I invited attention to the importance to our naval organization of the existence of some body—call it what you please—charged with the duty of giving responsible advice upon military affairs. I said then: "The organization which lacks this feature is defective in a vital part."

As you will recall, I declined to make a specific recommendation at that time and contented myself with urging the earnest attention of Congress to the subject. I believe it to be my duty now to take another step and to make a specific recommendation.

I desire to say that the recommendation which I am about to make is not one which will supplant the present organization of the navy department. It is rather one which supplements that organization. I do not think we can afford to remain content with the existing conditions if we can see any way in which they can be improved. The navy has grown and is

[5] See "Naval Administration under the Navy Commissioners, 1815-1842," by Charles Oscar Paullin. U. S. Naval Institute, Vol. XXXIII. No. 2, June, 1907.

growing rapidly. Naval expenditures have grown so that they are, roughly speaking, $100,000,000 a year, and they are not likely to diminish in the future. With our widely scattered possessions, and a coast line that exceeds that of any other nation except one, and with an intense desire for peace, our people have become convinced of the desirability, of the necessity, of an adequate and efficient navy.

EFFICIENCY THROUGH HONEST, ECONOMICAL ADMINISTRATION.

A large navy—large in ships and personnel—even with the addition of brave and skillful and devoted officers and men, does not necessarily mean an efficient navy. Efficiency comes only through such administration as expends honestly and economically the abundant appropriations given by Congress, and so employs the officers and men and ships as to develop their full capacity for effective use.

HEAD OF NAVY ALWAYS WILL BE CIVILIAN.

Clearing the way a little, I think we can say with certainty that, in conformity with the fundamental ideas which our people hold in common with at least one other nation, the official head of the navy under the direction of the President, who is the Commander-in-Chief, is and always will be a civilian. He is responsible not only to the President, but to Congress and to the country for the administration of the naval establishment. If there comes to be inefficiency and dishonesty and waste, and if there comes to be any great blunder, he alone is going to be held responsible. It will not be of any use for him to say, "I did the best I could." The country is not going to hold some unknown naval officer responsible. It is going to hold the civilian head of the navy to a just accountability for its present efficiency.

I think, therefore, it is just to him as well as essential to the national interests that there should be placed at his disposal such instrumentalities as will best enable him to perform the high functions which are committed to him by law.

SECRETARY CANNOT MAKE WAR PLANS.

Of course he must always be lacking in technical military knowledge. It would be unfortunate if he ever entertained the idea that he was a military man and that he could judge of military questions as well as a man who had made a lifelong study of such questions. He cannot make plans for war or for important operations in peace. He cannot know best how to provide for the needs of the fleet, or by what methods the men may be best trained, or how the capacities of officers may be best developed and utilized. As to all these subjects and those cognate to them he must rely upon the best military advice. It is not enough that there should be plenty of officers ready to give him advice when he seeks it. There should be those charged expressly with the duty of studying military questions and of giving advice for which they can be held responsible.

If I have a question of ship construction to pass upon, and I have many; if I have a question relating to armor or armament, and I have

many, the present organization of the department provides me with a responsible officer, upon whose advice I have the right to rely. I have the right to rely, in questions of shipbuilding, upon the chief constructor of the navy. If I took his advice upon a technical question of construction, I should make him responsible to the country. If there is a question of armor or armament, I have provided for me, by the present organization, the Chief of the Bureau of Ordnance. I am entitled to rely upon his advice.

RESPONSIBLE ADVICE.

Contrast the difference between taking the advice of a responsible officer and taking the advice of one who is irresponsible. Suppose a great mistake occurred in ordnance. It would not be an excuse to me that I had been advised by Admiral Taylor or Admiral Barker or Admiral Higginson, or any other officer whom I might name, because they are not charged with the duty of considering and giving advice on ordnance; but if I said "I have had the advice of Admiral Converse," who is placed at the head of the ordnance of the navy, then I could safely say I have met my responsibility.

Now, a body such as I have referred to has been quite often called a general staff, but I think the names are not important. The realities are the important things.

SOME BODY OF MEN SHOULD BE RECOGNIZED BY LAW.

By whatever name you choose to call it, or however you may choose to constitute it, it is my deliberate opinion that some body of men, charged with the duty I have attempted to describe, should be recognized by law.

It may be said that the Secretary already has the chiefs of bureaus as advisers. At the heads of those bureaus which you have now established by law there are and will be competent officers with adequate technical and military information. They are abundantly able to give safe counsel on the important duties with which their respective bureaus are charged; but they are engrossed with the duties of the administration of their bureaus. They have no responsibility for the consideration of these military questions to which I have referred, nor any duty to give advice upon them; and the world's experience has shown that no advice is good except that for which advisers are held responsible. The volunteer adviser is not usually of much assistance. Much as I have profited by the advice of the bureau chiefs, I know by practical experience that it is impossible for them to take from their administrative duties the time which will enable them to consider these questions with such deliberation as would render them willing to accept responsibility for advice.

NO BODY SHOULD BE CREATED WHICH WOULD USURP SECRETARY'S POWER.

There is another side to the question. On the other side I deem it of the greatest importance that no body should be created which would usurp the powers of the Secretary and make him its mere mouthpiece, or reduce him to a mere figurehead in naval organization. I believe that is not only of importance to the country, but of equal importance to the

y itself. It is the Secretary alone who can bring effective influence ›ear upon the national administration, or, in conference with the repretatives of the legislative part of our government, carry such weight : proper measures will be enacted by Congress and proper supplies ›rded. Of course, it is ultimately upon the action of Congress that all al efficiency must depend. I do not care how efficient a general staff ŕ be, or any body called by another name, however well that body may ;erstand the needs of the navy: they can never, in my opinion, except :imes of great emergency, wield that influence which brings into har-aious cooperation the national administration, the military power, and authority of Congress which governs us all.

n proposing this legislation to you, therefore, I have had in mind the ›ortance on the one hand of affording to the Secretary such skill and ·lligence as will render him indispensable aid, and on the other hand importance of preserving the civilian authority, so that there may be mony between the legislative, executive, and military functions.

These views of Secretary Moody were fully indorsed by former :retaries of the Navy, Hon. Wm. E. Chandler, sometime mem-· of the Senate Naval Affairs Committee, and General B. F. acy.

The Act of 1842 is still in force. It may be tabulated as fol-·s:

The President (Commander-in-Chief)

The Secretary of the Navy

ecutive and Military Branch: The "Employment of Vessels of Var").	Civil and Industrial Branch: (The "Procurement of Naval Stores and Materials, Construction, Armament and Equipment of Vessels of War").
cated. No provision made for ın office of naval operations.	Duties distributed among five bureaus —subsequently increased to eight. Clothed with executive authority.

This Act supplied the left arm of the militant body; *but cut off ' right arm.*

It will be seen from what has preceded that during the past 132 ırs Congress has made nine ineffectual attempts to create a m of naval administration worthy of the name. This is all more remarkable when it is considered that nineteen years ore the passage of the Act of 1798, establishing a Department the Navy (consisting of one civilian and some clerks), Con-ss, as already stated, created a Board of Admiralty, to wit: In ıgress, October 28, 1779: "Resolved, That a Board of Admi-ty be established to superintend the naval and marine affairs of

these United States, to consist of three commissioners, not members of Congress, and two members of Congress," etc.

The disposal of the question of naval administration is of such vital importance as to claim precedence over all others connected with the naval establishment. The principal points to be considered are few and obvious.

First, the Secretary of the Navy must be chosen from civil life; that goes without saying.

Secondly, there must be a board of naval officers authorized by law to act as advisers of the Secretary of the Navy on all questions relating to the "employment of vessels of war" (to quote the Act of 1798), "as well as all other matters connected with the naval establishment of the United States." This provides for the executive and military branch of the Department of the Navy; it is the first and most important step towards bringing the old navy department up to the requirements of the so-called "new navy."

The duties of the civil branch should be distributed, at the discretion of the Secretary of the Navy (as now provided for by the Act of August 31, 1842), among such bureaus as may be retained, but with the pernicious clause of that Act repealed. That clause runs as follows: The "orders of a chief of bureau shall be considered as emanating from the Secretary of the Navy, and shall have full force and effect as such." This clause authorizes an infringement upon the prerogatives of the Secretary—a fatal defect in the law.

Attention has been repeatedly called to the fact that this provision of the Act has the effect, in practice, of creating nine Secretaries of the Navy, each one, in his own particular sphere, clothed with executive authority equal to that of the constitutional Commander-in-Chief. This it is that has created the dire confusion, duplication of work, extravagance and irresponsibility which, according to several Secretaries of the Navy in the past, have characterized the business methods of the navy department for the last sixty years. And this clause, moreover, exposes the fallacy of the contention that, under existing law, the Secretary of the Navy has ample authority, by a redistribution of the business of the bureaus, to correct the many and serious evils of the system now complained of. The source of the trouble is in the law itself.

proposition for the organization of the navy department ᴇks to impair or restrict in any degree the powers and ibilities of the Secretary of the Navy, or share with others owers and responsibilities, as at present, is unworthy of a t's consideration.

e essential points conceded, all the various details must be out by a board of experts convened for the purpose.

ll be seen from the foregoing that there have been adopted, rent periods, two half-measures, each looking to the re- ation of the Department of the Navy, each half excellent f, but lacking in balance. It is only necessary to unite vo halves in an amended form in order to obtain a well d measure complete in itself.

the Act of February 7, 1815, furnished the military and ve half; the Act of August 31, 1842, supplied the other ne civil branch. Now let the former be re-enacted in sub- but in better shape, and combine it with the Act of 1842, ended so as to conform to the change, and the result would neme of naval administration based on sound military and s principles. We should then have both right arm and ı. In other words we should have an office for deliberation ection, and offices charged with the details of execution.

:

The President (Commander-in-Chief)
The Secretary of the Navy
The Assistant-Secretary of the Navy

and Executive Branch:	Civil and Industrial Branch:
ımmissioners.	Act of August 31, 1842.
irman of the board to be	Bureau of Yards and Docks.
ɔne responsible adviser of	" " Navigation.
ecretary." (See General	" " Ordnance.
ples.)	" " Construction and Repairs.
	" " Steam Engineering.
	" " Supplies and Accounts.
	" " Medicine and Surgery.
	Without executive authority.

ERAL PRINCIPLES GOVERNING NAVAL ORGANIZATION.

Commission on "Certain Needs of the Navy," appointed 27, 1909, by President Roosevelt, and of which Justice I. Moody was presiding officer, reported on "General les Governing Naval Organization," as follows:

1. The office of the Secretary of the Navy being executive in character, nothing should be admitted into an organization of the department which would qualify his authority or diminish his ultimate responsibility. He has been in the past, and in the future should be, a civilian. He is the representative of the President, the constitutional Commander-in-Chief of the army and navy, under whose direction his authority is exercised.

2. The duties in charge of the Secretary divide under the principal heads closely related but generically distinct: civil and military.

The civil duties embrace the provision or preparation of all the material of war. This is the function of the present bureaus.

The military duties concern the use of that material, whether in war or in such exercises as conduce to fitness for operations of war. For the direction of these military duties, no subordinate provision corresponding to the bureaus on the civil side exists in the present organization established by statute.

3. The discharge of both these classes of duty involves a multitude of activities, quite beyond the immediate personal knowledge and supervision of a single man. This necessitates a subdivision of the duties, by which means the supervision of the Secretary is exerted through the medium of responsible subordinates. In this subdivision the principle of undivided responsibility, within the appointed field of subordinate supervision, should obtain, as it does in the superior office of the Secretary.

The bureau system, as now established by law for the civil activities of the department, insures for each bureau this undivided responsibility, qualified only by the authority of the Secretary, which, if exerted, does not divide the responsibility, but transfers it to the Secretary himself. Independent authority, with undivided responsibility, though in principle proper, suffers historically from intrinsic inability to cooperate, where a number of such independent units are present. The marshals of the first Napoleon —especially in Spain—in the absence of the Emperor, offer a familiar illustration. The bureau system as at present constituted by law contains no remedy for this inherent defect.

4. The coordinating power is in the Secretary's authority; but, owing to the shortness of tenure in office, and to the inevitable unfamiliarity with naval conditions with which an incumbent begins, authority, though adequate in principle, is not so in effect. This inadequacy consists in lack of personal familiarity with the subjects before him, not merely severally, but in their collective relations; in short, lack of specific knowledge and experience. The organization should provide him with such knowledge and experience, digested formally, so as to facilitate his personal acquirement. In short, an advisory body, equipped not with advice merely, but with reasons. In order to avoid the interruption of continuity attending each new administration, entailing the recurrent temporary unfamiliarity of each new Secretary, it is expedient that this advisory body be composed of several persons, but while this provision would insure the continuity which inheres in a corporate body (in this case continuity of knowledge and of progress), the principle of undivided responsibility would dictate that one only of them should be responsible for the advice given to the common superior—the Secretary.

s regards the composition of the advisory body. the principles to arded are two: (a) The end dictates the means; (b) responsibility)e individual. in advice as well as in executive action.

The end is efficiency for war. The agents in war are the military officers. Their profession qualifies them best to pronounce upon the ter of the preparations for war of every kind, including not only :s of campaign and tactical systems, but the classes, sizes, qualities, maments of ships of war.

it the Secretary needs, specifically and above all, is a clear underig and firm grasp of leading military considerations. Possessed of he may without great difficulty weigh the recommendations of his :al assistants, decide for himself, and depend upon them for technical ion of that which he approves.

:ever constituted in detail, the advisory body should be taken y from the class to which belongs the conduct of war, and upon will fall, in war, the responsibility for the use of the instruments r the results of the measures which they recommend.

As regards individual responsibility for advice, it is suggested that cretary of the Navy nominate to the President the officer whom he best fitted to command the great fleet in case of war arising: and his officer, irrespective of his seniority, should be head of the ry body. He alone should be the responsible adviser of the Secretary. provision of a responsible adviser does not compel the Secretary to his advice, nor prevent his consulting whomsoever else he will. rovision suggested does not limit the authority of the Secretary; does provide him with the weightiest and most instructed counsel, lays upon the prospective Commander-in-Chief the solemn charge i all he recommends he is sowing for a future which he himself ave to reap.

essential principle in the constitution of such an advisory body is .e majority of the members should be on the active list and should)at at not infrequent intervals; and, specifically, the head of the the prospective Commander-in-Chief, should during the summer s take command of the concentrated battle-ship force for man-. target firing, and practice of every kind. This will insure also stained familiarity with the administrative routine of the fleet and)ractical matters.

i the two principal classes into which the duties of the Secretary of avy divide, civil and military, as enunciated in Section 2 above, rd "civil" corresponds largely to the activities known as technical; :re is no reason apparent why the same principle of undivided immeesponsibility should not be realized in the navy department in two ubordinates, responsible, the one for military supervision, the other hnical supervision, and for all information and advice given to the iry under these two heads. It is of course apparent that a persuitable Secretary may come to his office with as little previous dge of the kind called technical as he has of military; nay, he may 'ectly efficient, and yet not acquire in his four years of office either hnical or the military knowledge presumable in men whose lives have

been given to the two professions. Under the most favorable conditions every superior must take decisions largely on advice; which means not accepting another's opinions blindly, but accepting statements of facts and weighing reasons.

The principle of the Secretary's ultimate individual responsibility dictates that he be at liberty to consult as many advisers as he thinks necessary; but the principle of the individual responsibility of two chief advisers, for the advice given, tends to insure the most exhaustive consideration on the part of men selected for their special competency. Careful consideration with special competency give the best guarantees for advice, and a Secretary overruling it would do so under the weightiest sense of personal responsibility.

As a matter of detail, but yet so broad in bearing as to amount to a principle, it may be noted that while the adjective "military" is somewhat narrow in application, "technical" is extensive in scope. Naval construction, ordnance, and steam engineering are all technical professions. The selection of a chief technical assistant to the Secretary might therefore be made from the recognized technical experts of the navy, under any of the three heads named, or a competent civilian engineer and naval architect may be appointed as Second Assistant Secretary of the Navy, under whom the four technical bureaus may be coordinated.

7. In conclusion, it should be distinctly laid down as a cardinal principle that no scheme of naval organization can possibly be effective which does not recognize that the requirement of war is the true standard of efficiency in an administrative military system; that success in war and victory in battle can be assured only by that constant preparedness and that superior fighting efficiency which logically result from placing the control and responsibility in time of peace upon the same individuals and the same agencies that must control in time of war. There should be no shock of change of method in expanding from a state of peace to a state of war. This is not militarism; it is a simple business principle based upon the fact that success in war is the only return the people and the nation can get from the investment of many millions in the building and maintenance of a great navy.

(See 60th Congress, 2d session. Senate. Document No. 740.)

The proposed acts would, with the exception of a change of name, and a slight amendment of the Act of 1842, give the sanction of law to the organization of the Department of the Navy as it now tentatively exists.

It will be seen from what has preceded that the Act of August 31, 1842, abolishing the Board of Navy Commissioners, is still in force. With the abolishing of the Board of Navy Commissioners was abolished the body "charged with the duty of giving responsible advice upon military affairs." "The organization which lacks this feature," it has been explained, "is defective in a vital part."

With the abolishing of the Board of Navy Commissioners was olished the military head of our military marine.

With the abolishing of the Board of Navy Commissioners was olished the office charged with the conduct of war.

It must be plain to the dullest understanding that in this respect r naval organization is no more prepared for war to-day than it is sixty-nine years ago. And this, too, notwithstanding the lesns of two wars and the urgent appeals of successive administrans to Congress to remedy this grave defect—successive adminisations representing each one of our great political parties.

In a former article—*North American Review* of April—we id: "In building up a navy the public mind seems to be ntered on ships alone. Tables are published from time to time owing the comparative strength of navies as measured by the mber of battleships of each country together with their tonnage d gun-power."

This is misleading as far as our own navy is concerned, in that takes no account of all the various accessories essential to a et of the present day, such as naval bases, personnel, etc. In ntemplating with pardonable pride our fleet of battleships we ve lost sight of the fact that in abolishing the Board of Navy mmissioners in 1842 Congress has never substituted any office supply its place: We have fashioned the instrument—the fleet; t have failed to provide the power to wield it as a weapon of war.

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E AMERICAN NAVY IN THE ORIENT IN RECENT YEARS.

By CHARLES OSCAR PAULLIN.

I.

THE ASIATIC SQUADRONS 1865-1898.[1]

n the termination of the Civil War in 1865, the East India, siatic squadron, as it was now called, was reëstablished. tional vessels were gradually added to it, until in 1866 it ined nine, and in 1867 thirteen vessels. Soon, however, the decline of the navy set in, its size was slowly diminished, in 1889 it contained only three ships—three decaying hulks e old steam navy. The first ship of the new navy in the tic squadron was the U. S. S. *Charleston*, which arrived at hama in September, 1891. Seven of the eight ships that com-d the squadron in 1897 belonged to the new navy. The first hip after the Civil War was the *Hartford*, made famous by the vements of Farragut; and the last flagship before the Span-merican War was the *Olympia*, the principal vessel of y's fleet at the battle of Manila Bay. On the completion of uez Canal in 1869, a new route to the Far East was opened r ships, and in the following year the *Palos* took advantage on her outward passage to the station.

e commanders-in-chief of the Asiatic squadron from 1865 98, their principal flagships, and the periods of their service as follows: Rear-admiral H. H. Bell, *Hartford*, 1865-1868; nodore J. R. Goldsborough, *Hartford*, 1868; Rear-admiral

[1] e chief sources of information for this chapter are the Asiatic lron Letters, 1865-1871; Annual Report of the Secretary of the Navy 67, 54-62; for 1871, 275-313; Schley, W. S., Forty-five Years Under the 73-96; and House Ex. Doc. No. 1, part 1, 41 Cong. 3 sess., pp. 334- No. 1, part 1, 42 Cong. 2 sess., 112-153.

erests. Thus in 1866 a hundred seamen and marines, under e command of Lieutenant John W. Philip, was sent ashore at ewchang to capture a party of Chinese, which was implicated an assault upon the American consul at that place. In 1888, d again in 1895-1896 during the war between China and Japan, small detachment of seamen and marines was stationed at Seoul, orea, to protect the Americans residing there.

After the Civil War, the number of American merchantmen the Far East needing the protection of the navy was relatively naller than before, for our merchant marine never regained the estige that it lost during that conflict. The flag of the United ates was in large measure supplanted by the flags of Great ritain and Germany. In 1868, however, Rear-admiral Rowan ported that the American trade with Manila was still consider- ble, amounting to forty ships a year. Soon after the war the eadquarters of the squadron in China were established at Hong ong, and in Japan at Yokohama.

In March, 1867, the natives of Formosa murdered the officers nd crew of the American bark *Rover*, which had been wrecked n the coast of that island. Early in June, acting under orders rom the navy department, Rear-admiral Bell sailed from Shang- ai, with the *Hartford* and *Wyoming*, for the southeast coast of Formosa, for the purpose of destroying the lurking-places of the atives. During the voyage he organized a landing party com- osed of sailors and marines and armed it with muskets, rifles nd howitzers. On reaching his destination some interesting vents took place, which he described as follows:

"Next morning, June 13, at half past eight o'clock, we nchored within a half-mile of the shore, on the southeast side of he large open bay indenting the south end of Formosa, a some- vhat dangerous exposure at this season of typhoons, though a erfectly safe and convenient anchorage during the northeast nonsoon, from October until May. The landing of one hundred nd eighty-one officers, sailors, and marines, provided with four lays' rations and water, was made at half past nine o'clock, nder the command of Commander G. E. Belknap of the *Hart- ord*, accompanied by Lieutenant Commander Alexander S. Mac- enzie, fleet lieutenant, as second in command, who earnestly ought to go on the expedition. Soon after we anchored, the avages, dressed in clouts, and their bodies painted red, were seen,

through our glasses, assembling in parties of ten or twelve on the cleared hills about two miles distant, their muskets glistening in the sun, indicating the kind of arms they carried. Their movements were visible to us on board during the most of the day. As our men marched into the hills, the savages, knowing the paths, boldly decided to meet them, and, gliding through the high grass and from cover to cover, displayed a strategy and courage equal to our North American Indian. Delivering their fire, they retreated without being seen by our men, who, charging upon their coverts, frequently fell into ambuscades. Our detachments pursued them in this harassing manner out of sight of the ships until two o'clock p. m., when, having halted to rest, the savages took the opportunity to creep up and fire upon the party commanded by Lieutenant Commander Mackenzie, and that officer placing himself at the head of the company commanded by Lieutenant Sands, daringly led a charge into the ambuscade that was laid for them, and fell, mortally wounded by a musket ball, and died whilst being carried to the rear. The navy could boast no braver spirit and no man of higher promise than Lieutenant Commander Alexander S. Mackenzie. He was distinguished for professional knowledge, aptitude, and tact, and suavity of manners; which inspired the confidence and affection of men, while his impetuous courage impelled him always to seek the post of danger, where he was always seen in the advance, both a conspicuous mark and an example. Several officers and men having already experienced severe sunstrokes, and the command being generally exhausted and worn out by their efforts to get at the enemy during four hours' marching, Commander Belknap now thought it expedient to regain his picket on the beach, and, during this march of two or three miles, many of the men got into such a deplorable condition from the killing heat of the sun that the commander determined to return with them on board of ship, which he reached about 4 p. m., after an exhausting march of six hours under the sun at 92°. That afternoon the fleet surgeon reported the casualties of the day—one killed, fourteen sunstruck, four of them dangerously."[1]

Of the officers who took part in the skirmishes with the savages, Commander George E. Belknap, Lieutenant James H

[1] Asiatic Squadron Letters, 1867-1868, 303-307.

ands and Midshipman W. M. Folger later became rear-admirals. The chief marine officer, Captain James Forney, was made a major by brevet for his gallant and meritorious services on this occasion. He is now (1909) a brigadier-general, ranking next to the senior officer of his corps. The brave Mackenzie was buried with appropriate honors at Takao, Formosa, in the garden of the British consulate.

The opening of additional Japanese ports to foreigners and the continuation of the conflict between the Tycoon and Mikado gave considerable employment to our ships of war in 1867-1869. In the spring of 1867 all the foreign ministers visited the Tycoon at the inland port Osaka, the American minister, Mr. R. B. Van Valkenburgh, being conveyed thither from Yokohama by the *Shenandoah* and *Wyoming*. Toward the latter part of that year Bell assembled six vessels of his squadron at Osaka and the neighboring port Hiogo to participate in the events attending the opening of those ports to foreign commerce on January 1, 1868. After the conclusion of the ceremonies, Bell delayed his departure, since it was apparent that hostilities between the contending factions were likely to break out at any time. On the morning of January 11 a most lamentable accident occurred at Osaka. The admiral, Lieutenant Commander J. H. Reed, and thirteen men belonging to the *Hartford* started for the shore in a barge to visit the American minister. Before reaching their destination, the barge was capsized by a heavy sea, and all on board, with the exception of three seamen, were drowned, nothwithstanding every effort was made to save them by the boats of the squadron. On the death of Bell, Commodore J. R. Goldsborough became commander-in-chief.

The expected contest at Osaka between the opposing forces began on January 27 and lasted several days, ending in a decisive defeat of the Tycoon. On the night of the 31st that unfortunate ruler, accompanied by about a dozen of his principal retainers, sought refuge on board the American naval ship *Iroquois,* Commander Earl English, who received the refugees, and the next morning sent them to one of the ships of the Tycoon. On the following night the American, Prussian, Italian and Dutch ministers were compelled to flee from their legations to the *Iroquois* for safety. They too were received by English and were later conveyed to Hiogo, whither also came the French and

British ministers. Here, the legations were reëstablished, under the protection of guards landed from the foreign fleets in the harbor. The American fleet was commanded by Commander G. B. Creighton.

On February 4 a detachment of Japanese troops assaulted the foreign residents at Hiogo, wounding several of them, among others an apprentice of the U. S. S. *Oneida*. This act of violence was resented by a party consisting of the marine guard at the American legation, the body-guard of the British minister, and several boats' crews from the foreign fleets, which went in pursuit of the Japanese troops and drove them into the mountains near the city. Soon after this incident, in response to a request for protection jointly signed by all the foreign ministers, the commanders of the several foreign fleets took measures of defense by seizing four Japanese steamers, by landing a considerable party of sailors and marines, and by fortifying the foreign settlement. On the 8th an envoy of the Mikado arrived at the American legation with the information that the Tycoon had been outlawed and that the Mikado was supreme in the government of Japan. On his giving assurance that the foreigners would be protected, the detachments of sailors and marines were withdrawn, and the Mikado's forces took possession of the city. The Japanese officer who on February 4 had commanded his troops to fire on the foreigners was subsequently executed, in the presence of several officers of the foreign fleets and legations. At the request of Van Valkenburgh, Commander Creighton witnessed the execution, a grewsome sight, which he thus describes:

> In a few moments the prisoner came in, dressed in the usual dress of a person of rank, accompanied by the executioner, who pupil and most intimate friend. He walked with a steady firm step of the altar, where he knelt in prayer. He then arose and went the cloth where he knelt and made the confession that he was the ordered his troops to fire upon the foreigners, and also to fire when they were trying to escape and that he was sorry for what done. He then disrobed himself to his waist, and reached out that was near him, which he thrust into his bowels and drawing his right side, and leaning forward at the same time, the executioner one blow from his sword severed his head from his body.[1]

In March the ministers returned to Yokohama, United States, Italy and Prussia, taking passage

[1] Asiatic Squadron Letters, 1867-1868, 76.

S. S. *Monocacy*, Commander S. P. Carter. Here some Ameri-
and German marines and French and British troops were
cled for the protection of the foreign settlement. Early in
uary, 1869, the ministers went to Tokio (formerly Yedo), to
their respects to the Mikado, who, having triumphed com-
tely over the Tycoon, had taken possession of his capital.
mmander Carter conveyed Van Valkenburgh to Tokio, and
nessed his interview with the Mikado, the first between that
er and a representative of America. This initial meeting is
s described by Carter:

oon after we were shown into the waiting-room, the first Councilor
he Empire entered and was presented to the ministers, who were told
Mikado would in a short time be ready to receive them. Not long
rwards the court band commenced to play in a singularly weird and
ful strain, more like a funeral dirge or *miserere* than any thing else,
so different from Western music as to make it impossible for one to
cribe. I understood from some of the Japanese officers that the Mikado
then entering the audience-chamber. In a short time it was announced
he U. S. minister that the Mikado was ready to receive him.

short distance down the veranda and a turn to the right brought
o the entrance of the audience-room and in presence of the Mikado.
re was a bow after crossing the threshold, another when half way to
dais, and a third on reaching it. While the minister advanced on the
form to within a few paces of the Mikado, who sat on his throne (an
-chair apparently), under a canopy of white silk, with his Councilor
eling on his right; the suite stopped at the edge of it. On the minister
inning his speech, the Mikado rose to his feet. On each side of the
m were guards standing motionless, some dressed in red, and others
k silk.

hile the light in the room was not very good, the day being overcast
gloomy, I could not see anything in the face of the Mikado, indicative
ither much energy, mind, or character; still for one so young (he is
to be but seventeen), he conducted himself with becoming dignity.
was dressed in a robe of white silk and petticoat trousers of crimson,
had on his head a curious headdress of fine wire similar to those worn
several of his chief officers. After the minister had read his speech,
resented each of us by name. The audience was quite short, but every-
g passed off well and satisfactorily.

he Prussian chargé d' affaires had his audience immediately after the
S. minister, and the British minister soon after the latter. So far as I
heard the forms in the presentations were exactly similar in each

rom the castle we drove to the temporary Foreign Office, where later
e afternoon the Minister of Foreign Affairs gave first a Japanese and
rwards a European dinner to the three ministers and their suites, who
been that day presented to the Mikado. At the latter dinner the Min-

ister of Foreign Affairs proposed the health of the President of the United States, the Queen of Great Britain and the King of Prussia, which was properly honored. The health of the Mikado was afterwards proposed and drunk. The day ended pleasantly.

I have been thus minute for the reason that this is the first, and to this date, only audience that Americans have ever had with the Mikado of Japan."[4]

The Japanese civil war, which was succeeded by a long period of peace, was now at an end. Already political conditions in the Far East had so shaped themselves that it was possible to forecast some of Japan's future difficulties. Writing in 1869, Rear-admiral Rowan, after enumerating the encroachments of Russia in the islands of Saghalien and Yesso, expressed the opinion that "in twenty years Japan will be Russia unless foreign nations prevent."

While Rowan was in command of the fleet, the U. S. S. *Oneida* was lost in the Gulf of Yedo by a collision with the British mail steamer *Bombay*. The accident occurred at seven o'clock in the evening of January 24, 1870. The commander of the *Oneida*, Commander E. P. Williams, nineteen officers, and ninety-five seamen were drowned. Four officers and fifty-seven seamen were saved in the ships' boats. Unaware of the seriousness of the injuries she had inflicted, the *Bombay* continued on her course into port, notwithstanding that the sinking vessel made numerous signals of distress.

The most important work of the navy in the Far East during the third of a century that elapsed between our Civil War and the Spanish-American War was concerned with the opening of Korea, the Hermit Nation. That country is a peninsula, with an area of about ninety thousand square miles and a population of possibly ten million people. Like China and Japan it long pursued toward foreign nations a policy of isolation and exclusiveness. It was unable, however, to avoid having some connection with its two powerful neighbors, Japan and China. For many years Japan claimed a suzerainty over Korea, which in early times was acknowledged by the vassal state. Later Korea acknowledged the suzerainty of China and sent annually to Peking an embassy bearing tribute. Both China and Japan carried on a small trade with the Koreans.

[4] Asiatic Squadron Letters, 1869, 35-38.

oward the close of the eighteenth century the French Catholic sionaries obtained a footing in the peninsula, and for many rs successfully prosecuted their work, notwithstanding the osition of the Korean government. In 1832 the British East ia Company sent a religious and commercial expedition to ·ea, which, however, failed of important results. In 1866 the ·eans began a new persecution of the foreign missionaries, all whom were in a few months either driven out of the country killed. As many of the missionaries were Frenchmen, the nch government sent an expedition to demand satisfaction the injuries inflicted on its citizens. After capturing and ning the town of Kang-hoa, the French forces were so har-ed by the natives that they were compelled to withdraw and ·eturn to China.

n 1845 a resolution was introduced in the United States use of Representatives recommending that measures be imme-tely taken to effect a commercial arrangement with Korea; nothing came of this initiative. Not until about the time of French expedition was the United States brought into relation h the Koreans. In June, 1866, the American merchantman *·prise* was wrecked on the west coast of the peninsula; and castaways were supplied by the local authorities with neces-y comforts, were transported on horseback to the northern ntier and were there delivered to some Chinese officials.

·hree months later a quite different fate befell the officers and v of the American schooner *General Sherman*. The particu- of the visit of this vessel to Korea have never been fully ertained. It appears that she was chartered by an English se at Tientsin, was laden with merchandise and was sent to west coast of the peninsula to trade. Her owner (who sailed n the ship), master and mate were Americans; her supercargo interpreter were British; her crew were Malays and Chinese, there were two Portuguese on board. She sailed from Chi-on August 8, 1866. In November Rear-admiral Bell received ·d that she had been wrecked on the Korean coast, and that sequently she had been burned, with all her people, by order he king regent of Korea. He at once decided to send one of ships to investigate her loss, and he wrote to the Secretary of Navy recommending that the squadron be reënforced with ne fifteen hundred or two thousand troops, with a view to

obtaining possession of Seoul, the capital, and to demanding sat faction of the king regent. This advice the American gove ment did not see its way clear to follow.

The vessel chosen by Bell to investigate the loss was the U. S. *Wachusett*, Commander Robert W. Shufeldt, an offi equally distinguished for his naval and diplomatic achieveme Leaving Chi-fu on January 21, 1867, Shufeldt two days la came to anchor off the Korean coast opposite the Sir James Ha group of islands, near the mouth of a large inlet. Had the voya been feasible in the winter season, he would have proceeded t the Ta-tong (also called the Ping-yang) River, fifty miles nort ward, up which stream the *General Sherman* was lost. Shufel entered into communication with the natives at the villages ne his anchorage and, after meeting with some difficulties, induc one of the chiefs to despatch into the interior a letter addresse to the king of Korea. Several days after the departure of messenger with this letter, an official of Hae-chow-poo, t capital of the province in whose waters the *Wachusett* h anchored, came on board the ship. He said that he knew nothi of the *General Sherman*, and he ordered Shufeldt to dep speedily and return to his own country. The natives near th anchorage were more communicative respecting the lost vess and they all told the same story, namely, that she was burned i the Ping-yang River and that all her people were killed in melée on shore. Unable to secure any additional information an inclined to believe that he had the truth of the matter, Shufeld returned to China, without having received an answer to hi letter to the king. One may add that the inlet visited by th *Wachusett* was wrongly supposed to be the Ta-tong River, a may be seen from a chart prepared by her officers. The tru Ta-tong River they called the Ping-yang River.

Some months after the return of Shufeldt, it was reported th four seamen of the crew of the *General Sherman* were still aliv and were detained as prisoners in the city of Ping-yang. To test the accuracy of this report, Commodore Goldsborough ordered the U. S. S. *Shenandoah*, Commander John C. Febiger, to pro- ceed up the Ta-tong River and to investigate further the loss of the unfortunate schooner. In the spring of 1868 Febiger spent several days surveying the river and communicating with the local authorities. When about twenty-five miles up the stream,

was fired upon by a military post but was not hit. He ob- ed considerable information respecting the lost vessel, little which, however, could be depended upon. Among the com- nications that he received was one from the *ex-officio* inspector the Imperial Board of Directors of Korea, addressed to Com- nder Shufeldt and replying to that officer's letter to the king. is gave a version of the loss of the *General Sherman* favorable the Koreans, and represented her captain as the aggressor. e principal result of the visit of the *Shenandoah* was a survey the Ta-tong River and its approaches.[8]

The affair of the *General Sherman* naturally led our govern- nt to consider the possibility of making a treaty with Korea. th Rear-admiral Stephen C. Rowan, commander-in-chief of Asiatic squadron, and his successor, Rear-admiral John Rod- rs, proposed the sending of a naval expedition to Korea, similar that of Commodore Perry to Japan. The government finally cided to make an attempt to negotiate a treaty, to intrust the gotiations to Mr. F. F. Low, the American minister to China, d to provide him with an imposing naval escort. Rear-admiral odgers would have been chosen to undertake the mission in- ead of Low, had it not been desirable to enlist the good will of ina and, if possible, her good offices, by selecting the American plomatic representative at Peking. Low was directed to con- lt with Rodgers throughout every stage of the negotiations, and odgers was ordered to convey Low to Korea on board his flag- ip, accompanied with as many vessels of his squadron as could spared. In November, 1870, the two officers conferred to- ther at Peking and settled the details of the expedition. Doubt- s having in mind Perry's procedure in Japan, they agreed to ave Korea after they had informed the authorities of the pur- se of their visit and to return a month later for the reply of e government. "This," said Rodgers, "would prevent diffi- lties from arising between our peoples, avoid any appearance coercion and leave their imaginations to augment the dangers refusal." Before leaving Peking, Low sent through the hinese government to the king of Korea a message explaining

[8] Asiatic Squadron Letters, January, 1867-April, 1868, 693-702; October, 67-December, 1868, 164-196; one version of the loss of the *General Sher- n* will be found in the Korean Repository (Seoul) for 1895, pp. 251-254.

the purpose of the expedition and giving assurances of its frie
character.

Having collected all accessible information relating to th
navigation of Korean waters, Rodgers in May, 1871, assem
at Nagasaki a fleet of five steamships, carrying eighty-five g
and twelve hundred and thirty men. On board the flags
Colorado were the rear-admiral and Minister Low with his s
consisting of secretaries, interpreters, Chinese writers a
servants, and five shipwrecked Koreans who were being return
to their native land. Besides the *Colorado,* Captain G. H. Coop
the fleet comprised the *Alaska,* Commander H. C. Blake, *Beni*
Commander L. A. Kimberly, *Monocacy,* Commander E. P. Mc
Crea, and *Palos,* Lieutenant C. H. Rockwell. By the middle o
May the fleet was ready to sail. "On the morning of May 16th,"
wrote an observer on board the flagship, "the signal to weig
anchor was hoisted, and our saucy little squadron moved grace
fully through the magnificent outlet of Nagasaki harbor. Th
weather was calm and delightful, and all hands were high
elated with the prospect of penetrating the mysterious land th
had formed the theme of our dreams, arguments, and surmis
for many months."[6]

There was much doubt in Low's mind whether the missi
would prove successful. Rodgers took a brighter view of i
prospects, writing thus on the eve of its departure from Naga
saki: "The anticipations vary very much as to the reception w
shall probably meet. I will hope, until facts dispel hope, that w
shall meet with success. The time has come, I infer from what I
learn, for the Koreans to make a treaty; and if we do not succe
now, some other power or powers will probably be more fortu
nate."[7]

On the 19th the fleet arrived at the Ferrieres Islands on th
west coast of Korea, and on the 30th, after a course had bee
sounded and surveyed, came to anchor near the mouth of th
Salée or Han River, some thirty miles from Seoul. Low and
Rodgers decided to remain here until they communicated with
the king, and in the meantime to survey the river. Soon after
the *Colorado* anchored, she was visited by four Koreans who

[6] Willis, G. R., The Story of Our Cruise in the U. S. Frigate *Colorado,* &c.
[7] Asiatic Squadron Letters, 1870-1871, 309.

l that three officials of their government were waiting on re to ascertain the object of the expedition. On the next day officials came on board the flagship, and as they were of in-ior rank, Low directed his two secretaries to receive them. ey were informed that the American minister had important iness to transact with their government, which would be made wn to a person of equal rank duly appointed by the king, and t it was the desire of America to establish peaceful relations h Korea. They were also told, as had been the visitors of the vious day, that it was the intention of the surveying vessels proceed up the river and that every effort would be made to oid trouble. They made no objection, but, on the contrary, re "tacit assurances" that the expedition would meet with hing but civility and kindness from the natives.

On June 1 the *Monocacy*, *Palos*, and four steam launches, der the command of Commander H. C. Blake, went up the er on surveying duty. When about five miles from the fleet, little flotilla came to a sharp turn in the channel where the vigation was very difficult. The current, which set in from the ., was swift and full of eddies, and flowed over dangerous lges. On the left-hand side, on a hill overlooking the river, re some Korean fortifications, known as Fort du Coude, which re manned by a thousand men. In the main fort there were o or three large guns, perhaps as large as 32-pounders, and ny smaller guns. From a parapet a flag was flying, the inese inscription on which signified "commanding general." The launches of the flotilla were in the lead, and as they came east of the fort they were suddenly surprised by a heavy charge of artillery from some batteries on the hill-side, which l been concealed from their view by mats and screens. They once returned the fire as fast as the whirls and eddies of the er permitted. The *Monocacy* and *Palos* soon came up, and, ugh greatly hampered by the perilous navigation, they trained ir guns so effectively that within a quarter of an hour the reans fled precipitately to the ravines and brush covers in the r of their works, carrying with them their flags and standards. e current rapidly swept the flotilla past the turn of the river a position above the forts, where it came to anchor and con-ued to fire upon them as long as any indications of their being upied were discoverable. None of the vessels of the flotilla

was injured by the enemy's fire. The *Monocacy*, however, ran upon the rocks, and the *Palos* had to cut away her rail and bulwark on the port side to permit the use of her guns. The loss of the Americans was two wounded, and of the Koreans thirty killed and many more than that number wounded. One of the launches did not take part in the engagement. Being disabled early in the voyage, she followed the other vessels up the river at some distance and was fired upon by several forts below Fort du Coude, which did not molest the other vessels of the flotilla.

After a careful consideration of this incident, Low and Rodgers decided that the prestige of the United States would be impaired if the injury to its flag was not avenged or was not apologized for by the Korean government. Through one of his secretaries Low explained to an officer of the local prefecture that sufficient time would be allowed for an apology before any further steps were taken. While deeply regretting the firing on the flotilla, the officer defended the action of the forts, on the ground that the Korean laws prohibited foreigners to pass a barrier of defense. He sent a present of chickens, bullocks, and eggs to Rodgers, who declined to accept it.

In the meantime Low received a letter from the king, which, while somewhat evasive, plainly indicated that he did not wish to make a treaty with the United States. He denied that his subjects were the aggressors in the *General Sherman* affair, and referred to three instances in which he had protected shipwrecked Americans. Low did not reply to this letter as other matters now engaged his attention. No apology had been made by the Korean government, and a retaliatory expedition was being prepared for offensive operations.

Nine days elapsed between the firing on the flotilla and the sailing of the retaliatory expedition, an interval during which Rodgers was busily engaged with preparations for the intended movement. He organized and drilled a division of sailors and marines, made ready supplies and ordnance, and settled all questions of transportation. He chose Commander H. C. Blake to command the expedition. The command of the land forces fell to Commander L. A. Kimberley. Lieutenant Commander W. S. Schley was made adjutant of the land forces, which consisted of six hundred and fifty sailors and marines, a corps of sappers and miners, and an ambulance corps. The marines, one hundred and

n number, were under Captain McLane Tilton of the marine s. The co-operating force consisted of the *Monocacy* and r, four steam launches, and the boats of the fleet. The t of the expedition as set forth in Rodger's orders to Blake to capture or destroy the Korean forts that fired on the a and to hold them long enough to demonstrate the ability e Americans to punish the insult offered to their flag.

e expedition got under way about 2 p. m. of the 10th, the n launch *Weehawken* in the lead sounding the channel, fold by the *Monocacy*, three steam launches, the *Palos* with e on board, and nineteen boats containing most of the land-party. About three miles up the river, on the left-hand side, the first fortifications, called by the Americans the Marine oubt. A mile farther up on the same side was Fort Mono- and a mile still farther at the bend of the river Fort du le or Fort McKee. Opposite the last-named fort across the was Fort Palos. Concerning the events that look place on ing the Marine Redoubt Rodgers wrote as follows:

soon as the *Monocacy* came within good range, she opened upon emy's works with shell. The enemy returned the fire for a time, but soon driven out, and when our landing was made abandoned the on and fled. The *Palos* coming up, the boats pulled in for the shore effected a landing below the fort. The point chosen for the disem-tion, while seemingly as good as any in other respects, was for mili-reasons deemed the best, since it flanked the enemy's works and left ng to be feared in our rear. The character of the shore was unknown t proved to be most unfavorable for our purpose. Between the water he firm land, a broad belt of soft mud, traversed by deep gullies, had passed. The men stepping from the boats sank to the knees, and so ious was the clay that in many cases they lost gaiters and shoes, and trousers' legs. The guns sank above the axles of their carriages, and uired the strenuous exertions of many men to get them through. The ng was covered by the guns of the *Palos* and the steam launches.

e boats reached the shore at about noon. As soon as firm ground ttained the infantry battalion was formed and the marines deployed irmishers. The advance at once began and the first fort was quietly ied. This fort was constructed of stone; its walls being about twelve igh; from the upper flank stretched a long water battery. It mounted odd guns, of various calibre; most of them being the small bronze h-loading pieces of from one to two inch bore, five or six were about een pounders and there were two thirty-two pounders. The destruc-of the fort was at once begun. The guns were cast into the river, with xception of the thirty-two pounders, which were spiked. The walls e fort were thrown down and the stores of powder, provisions, and ng burned.

By this time the afternoon was so far gone that it was not expe make a further advance on that day. The force therefore went in upon a favorable spot in the vicinity of the fort. The marines w howitzer occupied the position in advance of the main body of th and pickets were established to guard against surprise during th The Koreans made an attack at about midnight, but it was con distant firing upon our lines; and a few shells thrown by the ho caused their retreat.[8]

The *Palos* ran on to some rocks, and was of little service expedition. After aiding in the reduction of the Marine Re the *Monocacy* passed up the river and silenced Fort Mor Sailing still farther up, she made preparations to co-operat the land forces, which at an early hour on the morning 11th broke camp and began their advance. They foun Monocacy deserted, and after dismantling it, they resume march toward Fort du Coude. For the succeeding event ger's narrative may be quoted:

The force again moved on. The march was a most difficult on country is a succession of steep hills, with deep ravines between, ove foot soldiers passed with great fatigue, while the guns were got by widening the paths and by cutting out the bushes and filling up in other places. They were dragged up steep acclivities, by who panies detailed to help the artillerists, or lowered down from the with ropes. A squad of sappers and miners, provided with shovel and axes, was very useful in facilitating the passage of the artil well as in destroying the fortifications. As the advance continued the upper and main fort, large bodies of the Koreans were seen on flank of our force, and in such position that, when the direction march was changed, as it must be to approach the forts, they woul hind us, and have us cut off from retreat should we be repulsed assault upon the forts in front. To guard against danger of an atta our rear while engaged in front, five howitzers, with three comp infantry, under the command of Lieutenant Commander [W. K.] W were placed in strong position, which they held as a rear guard the advance of the main body. Their service was most valuable, in as they checked several attempts of the enemy to advance, and t accurate fire prevented a large body from ever getting into action also did good service by their fire, directed over our forces, agai forts beyond.

At about 11 o'clock, on the forenoon of the 11th of June, the hill to the enemy's stronghold, or citadel was gained. The *Monocacy* moved up the river, keeping nearly abreast our land force, had tak tion and shelled the forts for some time before our men came up vicinity. This fire was continued until our assaulting force was

[8] Asiatic Squadron Letters, 1870-1871, 386-389.

n signal being made, it was discontinued. Behind the crest of the hill ch they occupied, our men were formed for the assault upon the citadel, distant about one hundred and fifty yards, and, covered from the ny's fire, they rested awhile to recover from the exhaustion of the ried march under a hot sun. Up to this time, although there had been e brisk skirmishing, but few of our men had been wounded; several been prostrated by sunstroke. The citadel about to be assaulted, the to the defenses upon the point below, was built upon the apex of a cal hill, about one hundred and fifty feet high from the bottom of the ne through which our men had to pass to reach it. The hill-side was steep; and walls of the fort joined the acclivity with scarcely a break he line. Had not the face of the walls been somewhat shattered by the ls from the *Monocacy* and the howitzers on shore, the escalade would e been most difficult.

ur men kept up a fire from their resting-place upon the fort whenever enemy exposed himself, and this they did constantly and with the most eless courage, for the Koreans maintained an incessant fire, mounting wall and discharging their pieces as fast as they could load. There no artillery in the citadel. When all was ready, the order to charge given by Lieutenant Commander [Silas] Casey, and our men rushed ward down the slope and up the opposite hill. The enemy maintained r fire with the utmost rapidity until our men got quite up the hill, then, ing no time to load, they mounted the parapet and cast stones upon our s below, fighting with the greatest fury. Nothing could check our men; they rushed. The heroic [Lieutenant Hugh W.] McKee was first to ant the parapet, and the first to leap into a hand-to-hand conflict. There fell, as his father fell in Mexico, at the head of his men, the first inside enemy's stormed works. Other officers and men were quickly over the apet. The fighting inside the fort was desperate. The resolution of the reans was unyielding; they apparently expected no quarter, and proba- would have given none. They fought to the death, and only when the man fell did the conflict cease. The enemy made no organized resist- e in the forts lower down, on the point toward the river. These were ned to a rear attack by the capture of the citadel, and the garrison fled. ny of them, however, fell under the fire of our musketry and howitzers, ich had nearly cut them off from retreat.[1]

At about the time the citadel surrendered, Fort Palos, on the posite side of the river, opened fire upon the *Monocacy*. She urned the fire and soon compelled the enemy to abandon the rt and retreat over the adjacent hills. In all five forts were ptured or destroyed; fifty flags and four hundred eighty-one eces of ordnance were taken, and twenty Koreans were made isoners. The loss of the enemy was heaviest at Fort du Coude ere he had three hundred and fifty men killed and wounded.

[1] Asiatic Squadron Letters, 1870-1871, 390-395.

more than half of them being killed. The loss of the Americans was three killed and ten wounded. The three men killed were Lieutenant McKee, a landsman of the *Colorado*, and a marine of the *Benicia*. The great gallantry of McKee was remarked by all who saw his impetuous charge. He was the first to enter the fort, and fell mortally wounded by a musket-ball in the groin and a spear-stab in the side. The second officer to reach the fort was Lieutenant Commander W. S. Schley, who shot dead the Korean that speared McKee, and who narrowly escaped the fate of his unfortunate comrade. The honor of hauling down the flag of the citadel fell to one of the marines.

On the morning of June 12 the expedition returned to the anchorage of the fleet near the mouth of the river. Its reception has been well described by one who witnessed it:

> The scene on reaching the fleet was one never to be forgotten. The *Monocacy*, gaily decked with captured flags and banners passed close to the *Colorado*'s stern. On the frigate's poop stood Admiral Rodgers, Minister Low, and their staff officers. The little band of sailors who had guarded the ship in our absence, gathered on the forecastle and sent out a joyous shout of welcome. From steamer and boats went back a deafening response, and for some minutes the bay resounded with cheers, music, the ringing of bells, and sounding of steam whistles. Suddenly, as if at a given signal, every voice was hushed, every head uncovered, banners drooped, flags fell to half-mast, and the soft morning breeze seemed vocal with a requiem to the dead. This involuntary tribute to our fallen comrades, so spontaneous, and yet so intensely dramatic, was the closing act of the campaign.[20]

Hoping that the disaster to the Korean arms would move the king to accept overtures for a treaty, Low renewed his attempt to communicate with him. The local officials, however, refused to forward Low's letters to their ruler, who probably never received a true account of the events that happened at the mouth of the Salée. As Rodgers regarded his force insufficient to make its way to Seoul, and as it was doubtful whether such a movement was authorized by the American government, Low decided to discontinue his mission. On July 3 the squadron weighed anchor, and two days later arrived at Chi-fu. On receiving an account of Rodger's operations, the navy department wrote to him approving

[20] Willis, G. R., The Story of Our Cruise in the U. S. Frigate *Colorado*, 80-81.

them, but at the same time cautioned him against undertaking the conquest of Korea.

II.

THE OPENING OF KOREA, 1880-1883.[11]

After the return of the Rodgers expedition in 1871, the American government for several years made no attempt to enter into a treaty with Korea. Indeed there appeared to be little or no prospect of success. In 1874, however, our chargé d' affaires at Peking reported that he had received information that a new Korean king and dynasty had come into power, and that they might be regarded as more favorably disposed toward the United States.[12] Two years later Japan made a treaty of amity and commerce with the hermit nation, which opened the ports of Fusan and Gensan to Japanese trade and permitted a Japanese minister to reside at Seoul. The success of Japan encouraged our government to consider the advisability of renewing its overtures. On April 8, 1878, Mr. Aaron A. Sargent, of California, chairman of the Senate committee on naval affairs, introduced in the Senate a joint resolution authorizing the President to appoint a commission to negotiate a treaty with Korea, "with the aid of the friendly offices of Japan." Several days later, this resolution, after a speech by Sargent urging its adoption, was referred to the Senate committee on foreign affairs, from which it never emerged.[13]

There seems to have been some connection between the Sargent resolution and a decision of the navy department, made in 1878,

[11] This chapter is based chiefly on the Shufeldt Papers, temporarily deposited by Miss Mary Abercombie Shufeldt in the Navy Department in Washington; and on the Cruise of the *Ticonderoga*, 2 volumes, to be found in the archives of the department. Of the Shufeldt Papers, the most valuable are the Korean Letter-Book (which contains all the official letters written by Shufeldt from July 1, 1881, to August 23, 1882), and the letters to Shufeldt of the State Department, Minister James B. Angell, and Chargé d' affaires Chester Holcombe. There is in the Shufeldt Papers an unpublished history of the cruise of the *Ticonderoga*.

[12] Secretary of State W. M. Evarts to Secretary of the Navy R. W. Thompson, Nov. 9, 1878, in Cruise of the *Ticonderoga*, U. S. Navy Department Archives, i, 19.

[13] U. S. Congressional Record, vii, part 3, pp. 2324, 2600-2601.

to send Commodore Robert W. Shufeldt[44] on an important commercial and diplomatic mission to certain eastern countries, including Korea. In the fall of 1878 the navy department placed the U. S. S. *Ticonderoga* at the service of Shufeldt for use in this mission. On December 7 she sailed from Hampton Roads for the west coast of Africa. We are not here concerned with the commodore's important work as arbitrator of the boundary between Liberia and the adjacent British possessions, as negotiator of a treaty with the king of Johanna, and as collector of commercial information at the numerous ports visited by him. It may be noted in passing, however, that the *Ticonderoga* entered the Persian Sea and sailed up the Euphrates River, being the first American ship of war seen in those waters. In the spring of 1880 she arrived in the Far East, reaching Hong-kong on March 26 and Nagasaki on April 15.

As early as 1867, when Shufeldt made his first visit to Korea, he conceived the project of opening up that country to the western world. After more than a decade, an opportunity for carry-

[44] Shufeldt had come to be regarded as one of the most eminent diplomatists of the navy and possessed to an unusual degree the confidence of his government. He was born in Dutchess County, New York, in 1822 and at the age of seventeen received a midshipman's commission. After fifteen years of service at sea and on shore, he resigned from the navy to enter the merchant marine. For two years he was employed on board the Collins' ships sailing between New York and Liverpool, and later he commanded several vessels sailing between New York and New Orleans. For a year he was engaged in making an attempt to open a transit route across the Isthmus of Tehuantepec. On the outbreak of the Civil War President Lincoln appointed him consul general to Havana, a post that he filled for two years under most trying circumstances and with conspicuous success. In 1862 the State Department sent him to Mexico on a confidential mission, which seems to have been connected with the occupation of that country by the French. As French troops were in possession of Vera Cruz, it required much tact and discretion to reach the capital and perform the duties required of him. In 1863 Shufeldt again entered the navy, this time as commander; and during the last two years of the war he rendered important service in the naval squadrons off the coast of the Confederacy, participating in several important operations, among others the capture of Morris Island and the attacks on Fort Wagner. His visit to Korea in 1867 has been noted above. Later he commanded a Tehuantepec surveying expedition, and for four years he served as chief of the naval bureau of equipment and recruiting in Washington—L. R. Hamersly, The Records of Living Officers of the United States Navy and Marine Corps (fifth ed.), pp. 25, 26.

ing out his plans had now presented itself.[15] His orders from the navy department required him "to visit some port of the Corea with the endeavor to reopen by peaceful measures negotiations with that government. It is believed that the attack upon the Corean forts in 1871 is susceptible of satisfactory explanation, and that a moderate and conciliatory course toward the government would result in opening the ports of that country to American commerce. You will give special consideration to this subject."[16]

The Department of State approved these orders. It, however, was less sanguine of success than the navy department, and it expressed the opinion that there was no material change in the prospect of entering into a treaty with Korea. Taking advantage of the intimacy between Japan and Korea, it directed Mr. John A. Bingham, the American minister to the former country, to apply to the Japanese minister of foreign affairs for personal or official letters to the Korean authorities, calculated to facilitate Shufeldt's mission.[17]

On arriving at Nagasaki, Shufeldt communicated with Bingham, at Tokio, and was informed that Inouye Kaoru, the Japanese minister for foreign affairs, refused to commend the mission to the favorable consideration of the government of Korea, on the ground that it might produce complications in the execution of the Japanese treaty and that it appeared that the Koreans were still disinclined to open their country to occidental nations. He, however, was willing to give Shufeldt letters to the Japanese officials in Korea, and at Bingham's request he wrote a letter introducing the commodore to Kondo Masuki, the Japanese consul at Fusan, one of the three Korean ports open in 1880 to the Japanese, situated on the southeast coast of the peninsula, some two hundred miles from Seoul.[18]

Accompanied by the American consul at Nagasaki and an interpreter, Shufeldt reached Fusan on May 4, one day from Japan.

[15] Shufeldt, R. W., Corea's Troubles, in the San Francisco *Chronicle*, Oct. 30, 1887, p. 2.

[16] R. W. Thompson to R. W. Shufeldt, Oct. 29, 1878, in Cruise of the *Ticonderoga*, i, 4-5.

[17] W. M. Evarts to R. W. Thompson, Nov. 9, 1878, in Cruise of the *Ticonderoga*, i, 12, 18-22.

[18] Cruise of the *Ticonderoga*, ii, 322-325.

He immediately delivered to the Japanese consul the letter of introduction, and, on the following day, he handed to the consul a letter addressed to the king of Korea and requested him to forward it to Seoul. In this letter Shufeldt attempted to explain satisfactorily the destruction of the *General Sherman* and the events growing out of that incident. He represented his present mission to Korea as a continuation of his former one; he set forth the present motives and objects of the United States; and he requested the king to appoint an officer to confer with him at Fusan. About twenty-four hours later the Japanese consul reported that the governor of the district in which Fusan is situated had refused to forward this letter, saying that he had no authority to forward it and that the Japanese were the only foreigners with whom he could hold intercourse. Balked in this manner, and unable to conceive of any peaceful method of reaching the king from Fusan, Shufeldt returned to Japan.[19]

Arriving at Yokohama on May 11, he at once brought all possible influence to bear on the Japanese government, with a view to inducing it to forward the letter to the king. Finally, after he had held various interviews with Bingham and the Japanese minister of foreign affairs, the last named official consented to cover the letter to the king with one of his own and thus send it to Seoul. Out of deference to the opinion of the minister and to avoid all pretext for hostility, Shufeldt consented to await a reply at Nagasaki for a period of sixty days, instead of proceeding again to Fusan or some other Korean port, as he had contemplated doing.[20] Through the kind offices of the Japanese government the letter to the king finally reached the Korean minister of ceremony at Seoul, who, however, refused to receive it, partly for the reason, as he asserted, that it was addressed to "Great Corai" instead of "Great Chosen." In further explanation of his refusal, he said:

> It is well known to the world that our foreign relations are only with Japan, neighboring to us, which have been maintained since three hundred years, and that other foreign nations are not only situated far from us, but there has never been any intercourse with them.[21]

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[19] Cruise of the *Ticonderoga*, ii, 327-348.

[20] Cruise of the *Ticonderoga*, ii, 349-365, 387-401.

[21] Korean Minister of Ceremony to the Japanese Minister of Foreign Affairs, in Cruise of the *Ticonderoga*, ii, 417-418.

Shufeldt considered the explanation of the minister evasive, and he suspected, rightly or wrongly, that Japan was not acting in good faith. He said:

> It is her policy indeed to monopolize the commerce of Korea. She possesses in that country exterritorial rights and rules the Koreans with an iron rod. Striving to free herself from the obnoxious sway of foreigners upon her own soil, she is unwilling to have these foreigners see how she has imposed these same laws in an aggravated form upon her defenceless neighbor.[22]

In the summer of 1880, while waiting in accordance with his promise to the Japanese government for news from Korea, Shufeldt made the acquaintance of Ü Tsing, the Chinese consul at Nagasaki, who wrote to Viceroy Li Hung Chang, the great Chinese statesman, informing him of the commodore's desire to make a treaty with Korea.[23] Under date of July 23 Li wrote to Shufeldt asking him to come to Tientsin, Li's summer capital, for a personal interview and to talk over matters. "I have heard your name for a long time," said Li, "but I have not yet had the pleasure of seeing you."[24] The invitation was accepted. On August 25, the commodore, having left the *Ticonderoga* at Chi-fu, arrived at Tientsin, and on the following day had a most important interview with Li, concerning which he wrote as follows:

> This interview partook largely of a personal and intimate character, and lasted nearly three hours. His Excellency asked me, first, if there was anything I desired. I told him in behalf of our government I desired that China would use her influence to secure with the Corean government a treaty of amity between Corea and the United States; that this country (Corea) lay directly between America and eastern nations, with which our commerce was in constant communication, and although Corea, I knew, was a poor country and promised but little in itself of commercial importance, yet as it was in the line of ocean travel it was of importance to secure from that government protection by treaty of American lives and property that might be stranded upon its shores. After a prolonged discussion, in which the strategic position of the peninsula of Corea with reference to Russia, China and Japan was pointed out, His Excellency told me that I might say to my government that he would use his influence with the government of Corea to accede to the friendly request made by me in be-

[22] R. W. Shufeldt to R. W. Thompson, Oct. 13, 1878, in Cruise of the *Ticonderoga*, 477-478.

[23] Shufeldt, R. W., Corea's Troubles, in the San Francisco *Chronicle*, Oct. 30, 1887, p. 2.

[24] Li Hung Chang to R. W. Shufeldt, July 23, 1880, in Shufeldt Papers; Cruise of the *Ticonderoga*, ii, 402-410.

half of the government of the United States to open negotiations with a view to such a treaty as before mentioned. For this friendly act I thanked him and assured him that it would meet with the appreciation it deserved. Before closing this subject it was decided that the action of the Corean government would be imparted to the American minister at Peking.... His Excellency then said that he had invited me to Tientsin with the view of getting the opinion of a naval officer in whom he had confidence on the result of a war between China and Russia, so far as naval operations on the seacoast of the former were concerned. He begged me to reflect on my answers, because he desired my opinion to have full force and effect not only with himself but in the counsels of the nations. I replied by saying substantially that in view of the formidable Russian naval force, thoroughly drilled and equipped, already upon the coast of China, and in view also of the incomplete and chaotic condition of the Chinese navy, of which I was well aware, the result could only be one of disaster to China. After discussing the crisis from an international point of view, His Excellency seemed much impressed and assured me that war should not occur between these two countries, if China could possibly avert it. He said that the two Empresses and the Prince of Kung, Prime Minister, were decidedly in favor of peace, and that he thought these counsels would prevail.

The result of this interview is necessarily given in brief, but I cannot refrain from expressing my admiration for the intelligence and judgment displayed by His Excellency, Li Hung Chang, and my extreme pleasure in the treatment received from him and the evident respect he entertained for my opinions.

In conclusion he expressed the hope that when peace was assured my government would permit me to assist China in the organization of its navy. This, of course, is a matter to some extent personal in its nature, but if consummated would add very much to American influence in China and probably end in the construction of ships for that government in American ship yards.[23]

Satisfied that he had placed the proposed negotiations in as good a position as the circumstances would admit, Shufeldt returned home, since the period allotted to the cruise of the *Ticonderoga* was about to expire. He arrived at San Francisco on November 8, 1880. In his opinion, the *Ticonderoga* had inaugurated a movement in Korea similar to that inaugurated by the *Columbus* under Commodore Biddle in Japan, and it only remained for the United States to follow up the movement in Korea with a squadron of ships under a discreet officer, as it had done in Japan. He said that

the acquisition of Alaska and the Aleutian Islands, the treaties with Japan, Sandwich Islands and Samoa, are only corollaries to the proposition that

[23] R. W. Shufeldt to R. W. Thompson, Aug. 30, 1880, in Cruise of the *Ticonderoga*, ii, 466-470.

Pacific Ocean is to become at no distant day the commercial domain
America . . . . If any means can now be found to get beyond the barred
s and to reach the central government, I am convinced that Corea
d be made to understand, not only the policy of a treaty with the
ted States, but its absolute necessity as a matter of protection against
aggression of surrounding powers. Corea would in fact be the battle-
of any war between China and Russia or Japan, in whichever way
e nations might confront each other.[26]

On reaching Washington, in November, 1880, Shufeldt did not
sight of his great ambition, the opening of Korea to the
tern world; nor of Li's request that he should serve him in the
acity of naval aide in organizing the Chinese navy. After the
modore left Tientsin in August, he wrote to Li recommending
tenant D. P. Mannix, commander of the marines of the
nderoga, as a suitable officer to give instruction in the use of
edoes. Li fell in with the suggestion and at once offered
nix the post of torpedo instructor in the military school at
tsin. In the spring of 1881 the authorities at Washington,
onding to a request from the Chinese government, granted
nix permission to accept the offer.[27]

the meantime Shufeldt had been successful in promoting a
ion for himself. He urged his government to send him to
a for the purpose of aiding Li in organizing the Chinese navy
of making a treaty with Korea by means of Li's assistance.
etary of State James G. Blaine entered heartily into Shufeldt's
s, and on March 15, 1881, wrote to the Secretary of the Navy
circumstances rendered it desirable that a naval officer of
uate rank and reputation should be attached to the United
es legation at Peking, and suggested Commodore Shufeldt as
itable officer for the proposed service. Shufeldt's objects were
e kept secret, and his position as attache to the legation was to
e as a blind to them. Even our minister to China, Mr. James
Angell, was not notified of the appointment until the commo-
informed him of it in Peking. On March 19, the Secretary
he Navy directed Shufeldt to report to the minister at Peking
special duty, proceeding thence at such time as the Secretary
State might designate. On May 9, Blaine ordered him to leave

R. W. Shufeldt to R. W. Thompson, Oct. 13, 1880, in Cruise of the
nderoga, ii, 474-481.

Li Hung Chang to R. W. Shufeldt, Sept. 21, 1880; Executive Letters,
S. Navy Department Archives, xxxiii, 307.

San Francisco on the 19th for Peking, and to stop on his way at Tientsin to ascertain whether the Korean government was ready to resume negotiations for a treaty. On reaching China he was to wait for further instructions respecting Korea. The State Department granted him permission to aid Li in organizing the Chinese navy.[*]

The commodore was accompanied to China by his daughter, Miss Mary Abercrombie Shufeldt, who acted as his secretary. He arrived at Shanghai on June 21, and thence proceeded to Tientsin to see Li Hung Chang, before reporting at Peking. On July 1 Shufeldt had an interview with the viceroy. The latter said that in accordance with his promise made in the previous August, he had had a conversation with a Korean official in China respecting a treaty between the United States and Korea, and that the official was much impressed with the advantages that his country would derive from such treaty. Li further said that he had written to the government of Korea on the subject but had not yet received a reply. He advised the commodore to exercise patience and expressed the opinion that eventually the United States would realize its wishes. He, however, appeared less enthusiastic than at the previous interview and less willing to act as an intermediary. This change of heart the commodore ascribed to the recent treaty between China and Russia, which lessened Li's dread of Russian aggression. The viceroy was annoyed at an effort which, he understood, had been made by our minister to Japan to persuade Korea to send an envoy to Tokio to confer with our minister respecting a treaty. He said there were two parties in Korea, one in favor of and the other opposed to intercourse with foreigners, and that the king and the court officials belonged to the first of these parties. He expressed his satisfaction with the work already performed by Lieutenant Mannix as torpedo instructor. On the day following this interview, the viceroy returned the commodore's call, and subsequently Shufeldt accompanied him on a visit to one of his men-of-war and witnessed a drill conducted entirely by Chinese officers.[*]

[*] Executive Letters, xxxiii, 377; Secretary of State J. G. Blaine to R. W. Shufeldt, May 9, 1881; C. L. Fisher to R. W. Shufeldt, March 3, 1881; J. G. Blaine to C. Holcombe, Nov. 14, 1881, in Shufeldt Papers.

[*] R. W. Shufeldt to J. G. Blaine, July 1, 1881; R. W. Shufeldt to Secretary of State F. T. Frelinghuysen, Jan. 23, 1882.

n leaving Tientsin, the commodore went to Peking, where on 7 he presented to Minister Angell his credentials as attaché ne legation. After paying his respects to the Tsung-li Yamen, Chinese foreign office, he returned to Tientsin, where he estab-ed himself, with his daughter in charge of the social affairs of household, always matters of great importance in the Orient. ut the middle of July he had another interview with Li, who, arently influenced by news of Japanese encroachments in ea, again manifested much interest in the negotiation of the osed treaty. He said that he had sent a letter to the Korean ernment of such import that it would at least elicit a reply, if ould not be the means of the appointment of a Korean official onsult with respect to a treaty. He expected a reply within ty days, and he asked the commodore to remain at Tientsin eceive it and to meet the Korean official, should one be sent e.[illegible]

uring the remainder of the summer and all of the autumn of Shufeldt was at Tientsin, awaiting news from Korea. He expected Li to take some action regarding his offer of a onsible post in the Chinese navy, but the viceroy found it sable to avoid that subject. For a time, however, he frequently ulted Shufeldt respecting naval affairs and often adopted his gestions. The commodore's constant visits to Chinese ships of and arsenals created a general impression that he was to take ge of the Chinese squadron of the North. This aroused the of some of the foreigners in the Chinese service, and several ne foreign ministers at Peking used their influence to prevent employment. Responding to the pressure that they brought ear, Li became less and less communicative respecting naval ers; and finally Shufeldt, in order to maintain the dignity of ank and station, declined to have any further connection with Chinese navy.[illegible]

he period of ninety days fixed by Li as sufficient for the recep- of news from Korea expired about the first of October, and news had been received. Shufeldt's position now became ex-ingly embarrassing, and the question arose whether under the

R. W. Shufeldt to J. B. Angell, June 18, 1881; R. W. Shufeldt to F. T. nghuysen, Jan. 23, 1881.

Korean Letter-Book, 7-10, 23-24, 27-28; C. Holcombe to R. W. Shu-, Nov. 9, 1881; J. G. Blaine to C. Holcombe, Nov. 14, 1881.

circumstances his dignity would not be sacrificed by his remaining longer at Tientsin, where to outsiders he appeared as a hanger-on to Li's court and a solicitor of a naval job. Minister Angell advised his departure, and Mr. Chester Holcombe, the American chargé d' affaires, who in October succeeded Angell at Peking, was inclined to agree with his predecessor.[illegible] The Commodore, however, decided to remain until he heard from Korea.

Finally on December 15, Shufeldt received a call from the viceroy's naval secretary, who was sent by his master to say that a Korean official had reached Tientsin bringing the information that Korea was now willing to make a treaty with the United States. The commodore replied that he would communicate this intelligence to his government at Washington, that if it wished to make a treaty it would appoint a commissioner, and that the negotiators probably could not begin work until spring. Not only the necessity of waiting until the American government appointed a commissioner, but also the fact that Li was about to depart from Tientsin to Pao-ting-fu, his winter capital, made a delay imperative. On receiving this news Shufeldt sent it to Holcombe to be telegraphed to Washington. Soon after its receipt there, Secretary of State Frederick T. Frelinghuysen, who had succeeded Blaine, telegraphed these words to Holcombe: "Congratulate Shufeldt on prospect of successful negotiation."[illegible]

The commodore was disappointed in not receiving additional instructions from his government in respect to Korea in the summer or fall of 1881. The assassination and death of Garfield, however, had more or less interfered with the plans of the administration. When he received information of Korea's willingness to negotiate, he was not aware that his government had already appointed him a special envoy to Korea and had authorized him to negotiate a treaty with that country. His instructions were signed by Secretary Blaine on November 14, and his letter of credence by President Arthur on the following day. He was also provided with a letter written by the President to the King of Korea. Rear-admiral Clitz, the commander-in-chief of the Asiatic squadron, was directed to place a vessel at his service. On January

[illegible] J. B. Angell to R. W. Shufeldt, Oct. 14, 1881; C. Holcombe to R. W. Shufeldt, Nov. 26, 1881.

[illegible] R. W. Shufeldt to C. Holcombe, Dec. 16, 1881; F. T. Frelinghuysen to C. Holcombe, Jan. 7, 1882.

6, 1882, the new Secretary of State wrote to him increasing powers, giving him a few additional instructions, congratulat- him on the auspicious beginning of his mission and expressing reciation of the friendly aid received from Li.[84]

hufeldt's prime purpose, according to his instructions, was to in a treaty for the relief of American vessels and crews ship- cked on the Korean coast. However, should he find the temper disposition of the king favorable, he was also to negotiate a ty of amity and commerce, securing rights of trade, fixing fs, establishing consular and diplomatic representation and ting ex-territorial jurisdiction. He was cautioned not to ask too much, as the initial treaty might well serve as a first step pening a hitherto closely sealed country. He was ordered not egin negotiations unless there were reasonable prospects of ess. In carrying out his instructions he was left largely to his discretion. His stay in Korea, however, was limited to two ths.[85]

hufeldt did not receive the Blaine instructions until January Four days later he wrote to Li, who was still at his winter tal, informing him of the action of the Washington govern- t and suggesting the propriety of meeting him at such time place as he might select. The viceroy replied that he would glad to see the commodore at Pao-ting-fu, provided he would e incognito. This he declined to do, as he did not wish to give negotiations the character of a personal intrigue between him- and the viceroy. It was then settled that the interview should postponed until Li's return to Tientsin in March.[86]

The prospects for a successful outcome of the mission seemed hly flattering. There was danger, however, that complications ht arise. It was known that the viceroy had urged the British ister at Peking to inaugurate a negotiation with a view to a ty between England and Korea.[87] Fortunately for Shufeldt governments at both Peking and Seoul now showed the great- interest in the opening of Korea to intercourse with the western

J. G. Blaine to R. W. Shufeldt, Nov. 14, 1881; President Arthur's r of credence dated Nov. 15, 1881; F. T. Frelinghuysen to R. W. Shu- t, Jan. 6, 1882; R. W. Shufeldt to J. M. B. Clitz, Jan. 20, 1882.

J. G. Blaine to R. W. Shufeldt, Nov. 14, 1881; F. T. Frelinghuysen to W. Shufeldt, Jan. 6, 1881.

Korean Letter-Book, 17-20, 42-44, 46.

Korean Letter-Book, 74.

nations. Not Li alone, who was inclined to represent himself as the prime agent in bringing together the contracting parties, but the Chinese government also was supporting the movement to open Korea, as may be seen from the following extract from a letter of Holcombe, dated February 4, 1882:

> I was at the Yamen—the Foreign Office—on Wednesday last, and sounded the Ministers on the Corean question. They responded more readily and freely than I had anticipated, and told me some things which surprised and pleased me and which explain Li's course in the Corean question.
>
> All matters concerning Corea have in past years been attended to by the Board of Rites here, the oldest, highest, and most intensely anti-progressive of the Six Boards. The Yamen told me that last spring, through Prince Kung's influence, Corean questions were transferred from the Board of Rites to the Foreign Office; that the Emperor of China himself wrote a letter to the King of Corea, urging him to establish treaty relations with Foreign Powers, and first with the United States; that Li was simply ordered to forward that letter; that the King of Corea had replied that he was willing and even anxious to negotiate with the United States. They added that the King and a large proportion of the people of Corea unde- stand the situation and are ready for foreign intercourse, but that there there, as in China, an anti-foreign party.[*]

Early in February Shufeldt went to Peking to confer wi Holcombe. As the latter had resided in the Far East for sever years and was an accomplished Chinese scholar, it was agre that he should attend the interview with Li. His presence, it w thought, "would perhaps render Li himself a little more cautio and consequently reliable," and would place a check on Li's "e ceedingly slippery interpreters." Shufeldt again visited t Tsung-li Yamen, and found it quite cordial and eager to aid hi in his negotiations. Before returning to Tientsin, he and H combe prepared a draft of a treaty with Korea (draft No. 1 This contained no reference to China's claim to suzerainty ov Korea, on the inclusion of which, it was well known, the vicer was determined to insist.[*]

On the arrival at Li at his summer capital, about the middle March, it soon appeared that the terms of the treaty were to virtually settled at Tientsin and not in Korea, and that the vicer

[*] C. Holcombe to R. W. Shufeldt, Feb. 4, 1882.

[*] R. W. Shufeldt to C. Holcombe, Dec. 4, 1881; C. Holcombe to R. Shufeldt, Jan. 31, 1882; R. W. Shufeldt to F. T. Frelinghuysen, March 1882.

was to represent both his own government and that at Seoul. With the latter he kept in touch by means of its representative in Tientsin, who stayed in the background and who had no formal connection with the negotiations. "I have every reason to believe," wrote Shufeldt on April 10, "that there is at this moment in Tientsin a Korean official who is consulted at every step."[60]

The negotiator on the part of China and Korea, Li Hung Chang, was easily the most powerful man in the Chinese empire and in large measure dominated its foreign policy. He was viceroy of Chili (the province in which Tientsin is situated), senior guardian of the heir apparent, grand secretary, commander-in-chief of eighteen provinces, commissioner of coast defenses, etc., etc. Shufeldt described Li as he appeared at this time, somewhat unsympathetically it is true, as follows:

He is fifty-nine years of age, six feet two inches in height; has a clear, cold, cruel eye and an imperious manner. He is a thorough oriental and an intense Chinaman. These imply contempt for western nations and hatred for all foreigners. Li Hung Chang is the Bismarck of the East; he keeps together an incongruous empire and an effete dynasty by the repressive force of an indomitable will. He suppresses rebellions by decapitation and quiets the turbulent with the bamboo; yet he is great, not because he is so much in advance of his countrymen, but because he is not so far behind as they are in an appreciation of the arts political and physical which govern the modern world. He at least recognizes the value of these forces; he buys ships of war, constructs forts, experiments in torpedoes and drills troops with modern arms.[61]

On March 25, accompanied by Holcombe, Shufeldt held the first of a series of interviews with Li. Concerning what took place at this meeting, he wrote to the Secretary of State as follows:

His Excellency authorized the following statement, which I told him I intended forwarding to Washington.

The King of Corea and his prime minister are in favor of opening the country to foreigners, and are not only willing but anxious to treat with the United States, but there is a faction at court and among the people intensely hostile to the movement. A Corean envoy has recently visited His Excellency at Pao-ting-fu, and it was then determined to ask the Corean King to send an ambassador to China for the purpose of making a treaty with the United States, under the supervision of His Excellency the Viceroy, and to return to Corea when I go to that country for its ratification.

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[60] R. W. Shufeldt to F. T. Frelinghuysen, April 10, 1882.

[61] R. W. Shufeldt to A. A. Sargent, Jan. 1, 1882, in Korean Letter-Book, 32-33. See also San Francisco *Evening Bulletin*, March 20, 1882, p. 3, and other American newspapers of about the same date.

To facilitate this arrangement I have transmitted a draft of a treaty to the Viceroy, such as I thought would accord with my instructions, and His Excellency in return has presented one, which, while stipulating for the quasi-political dependence of Corea, is yet not by any means incapable of being reconciled with our own demands.

On Saturday next [April 1], I am to present my objections to this draft to the Hai-kwan-Taotai, who is empowered to discuss the question with me.

Both Corea and China are anxiously looking for protection against the growing aggression of Japan on the peninsula. In this connection the Viceroy informed me in the strictest confidence that the King of Corea would now be glad to see an American man of war in the Seoul River, and His Excellency advised me by all means to go to that point and to get as near the capital as possible. . . .

I informed His Excellency that the United States had now been waiting more than a year for the action of the Chinese authorities in the matter of Corea, that the proposition to intercede came from His Excellency, that the United States had accepted it in the friendliest spirit, and that I hoped there would be no delay in the action foreshadowed; and I further told him that if there was no prospect of success by May 1st, prox., I should telegraph to the State Department and advise the abandonment of the project. His Excellency said that he had promised me his assistance in this matter, and he intended to fulfil it to the extent of his power.[45]

On exchanging the first drafts of the treaty (drafts Nos. 1 and 2), it was apparent that the only important differences between the negotiators related to the first article as drafted by Li, and especially to Li's inclusion of the following sentence: "Chosen, being a dependent state of the Chinese Empire, has nevertheless heretofore exercised her own sovereignty in all matters of internal administration and foreign relations."[46] At an interview, held on April 1, between Shufeldt and the hai-kwan-taotai, Li's principal assistant, the latter made the commodore's assent to the Chinese draft of article 1 the *sine qua non* of any further discussion of the treaty. The Commodore refused his assent and the interview came to an end. Shufeldt now prepared "draft No. 3," a combination of Nos. 1 and 2, with the objectionable features left out and Li prepared "draft No. 4," a combination of 1 and 2, with the objectionable features left in. At an interview held at Li's yamen on the 5th, the viceroy declared that article 1 was indispensable, that the instructions of his government made its inclusion imperative and that it was written at the desire of the king of Korea. Shufeldt then read an argument against its inclusion

[45] R. W. Shufeldt to F. T. Frelinghuysen, March 30, 1882.
[46] Draft No. 2, in Shufeldt Papers.

He submitted that, since Korea (as asserted in article 1), was in possession of sovereign powers in respect to its foreign and domestic relations, the United States had the right to treat with her independent of the suzerainty of China. He declared that a reference to China was not pertinent to the treaty, that it might cause complications, and that he had no power to connect the United States with China as the joint protector of Korea. Subsequently, after a considerable discussion of the question, Li asked for four days in which to consider it.

By the 10th the treaty seemed to be practically completed, as the viceroy had agreed to waive article 1, provided the commodore would make a request in writing for a messenger to accompany him to Korea as the representative of the Chinese government and would state in the request that, owing to the fact that Korea was in a certain sense a dependent of China, he had asked for the intervention of the Chinese authorities for the accomplishment of the purpose in view. To this proposition Shufeldt was willing to assent. He also promised to forward to the President of the United States a letter, which was to be written by the king of Korea and after the treaty was signed, stating that the treaty had been made by and with the consent of the government of China.[48]

Subsequently to reaching these agreements, the question of the inclusion of article 1 was again brought up for discussion, and at one time so procrastinating were the tactics of the Chinese and so serious was the breach between the negotiators that Shufeldt threatened to break off the negotiations and proceed to Chi-fu. His spirited stand brought the Chinese to terms, for they were as desirous as he that the treaty should be made.[49] The cause of the failure of Li's proposition respecting the waiving of article 1 and the result of that failure are thus set forth by the commodore:

This proposition would have been agreed to, if, during an interview between Mr. Holcombe and the Foreign Office at Peking, that office had not proposed to him whether in some way less positive the suzerainty of China over Corea might not be mentioned in the treaty. To this proposition Mr. Holcombe did not see the objections which had occurred to me. Conse-

[48] R. W. Shufeldt to Li Hung Chang, April 4, 1882; memorandum of R. W. Shufeldt dated April 6, 1882; R. W. Shufeldt to F. T. Frelinghuysen, April 10, 1882.

[49] Shufeldt, Miss M. A., The Treaty with Korea, 8-10, in Shufeldt Papers; rough draft of Shufeldt's ultimatum to Li Hung Chang (undated), in Shufeldt Papers.

quently the Foreign Office addressed a letter to the Viceroy on the subject, and out of deference to the wishes both of the Foreign Office and His Excellency the Viceroy, although contrary to my own judgment, I sent to the Department on the 12th inst. the following telegram: May I insert in treaty with Corea an article admitting dependence of Corea upon China, China conceding sovereign powers to Corea. They desire it. I have objected. Answer.[66]

By April 19 the treaty was completed in every particular except one, the question of the admission of the suzerainty of China. On that day Shufeldt telegraphed the Secretary of State as follows:

Business arranged, except subject cipher telegram [refers to telegram of the 12th]. Ready start for Corea. Must have interpreter. Suggest Holcombe. His assistance very necessary. Thirty days probably sufficient. Can you send him, putting Taylor in charge of archives at Peking?[67]

For several days Shufeldt awaited replies to his telegrams, but no replies came. Under date of January 20 he had written to the department, asking for authority to employ an interpreter, but his request was not attended to. Much vexed at the strange action of his superiors in Washington, he made preparations for his departure to Korea. He and Li agreed, tacitly or otherwise, to abide by the compromise measures originally accepted in lieu of the exclusion of article 1. From Tientsin he went to Shanghai and thence to Chi-fu, where he arrived on May 4. Here he found the U. S. S. *Swatara*, Commander P. H. Cooper, detailed by Rear-admiral Clitz for Korean service, and three vessels of the Chinese navy, under the command of Admiral Ting. Here had also arrived the representative of the Chinese government, Ma-Kie-chong, an expectant taotai of the honorary title of the second rank. This official informed the commodore that Li had forwarded a copy of the proposed treaty to the king of Korea, and that it did not contain the objectionable article, which the commodore feared Li might insert. At an interview with Ma it was agreed that the Chinese vessels should leave for the mouth of the Salée, or Seoul, River on the morning of the 7th, and the *Swatara* twenty-four hours later—an arrangement that was carried out.[68]

At seven o'clock on the morning of May 8, the commodore and his Chinese interpreter having come on board, the *Swatara* got under way for the coast of Korea. Her departure caused much

[66] R. W. Shufeldt to F. T. Frelinghuysen, April 28, 1882.

[67] R. W. Shufeldt to F. T. Frelinghuysen, April 28, 1882.

[68] Korean Letter-Book, 63-68.

motion among the foreign vessels in the harbor, several of
h hastened to send dispatches to their ministers at Peking.[88] At
p. m. of May 12 she anchored at the mouth of the Salée River,
tle below Roze Island, and found there the Chinese corvette
-*Yuen*, bearing the flag of Admiral Ting, two other Chinese
els and the Japanese gunboat *Banjo*. On the following day
who acted as intermediary between the Americans and
eans, called on Shufeldt to arrange for a visit of two Korean
missioners who had been appointed by the king to "negotiate"
reaty.

ne principal commissioner, Shin Chen, president of the royal
net, had negotiated the Korean-Japanese treaty. His col-
ne was Chin Hong Shi, a member of the royal cabinet and for-
y an envoy to Japan.[89] On the 14th these two officials,
ded by their staff and an interpreter, visited Shufeldt, and
received with a salute of three guns, the courtesies of the
being extended to them. They were exceedingly friendly in
expressions of good will, and after their return ashore they
aboard presents of rice, eggs, fowls and beef. Six days later
eldt, accompanied by several officers, visited the commission-
t a place in the interior about six miles from the ship, called
Chuen. Here the credentials were examined and found satis-
ry, and the commodore presented the commissioners with
ur's letter to the king, insisting that it should be delivered as
ssage from a sovereign ruler of a friendly nation and answered
e same terms. It was here settled that two days later a meet-
hould be held on shore, in sight of the *Swatara*, for the pur-
of sealing, signing and delivering the treaty which had been
ected at Tientsin.[90] Concerning this last formality, which
place on May 22, the commodore made the following memor-
m:

y 22: At 9.30 a. m. Commodore Shufeldt, accompanied by Commander
Cooper, Lieutenants E. C. Pendleton and H. R. Tyler, Surgeon J.
awke, Paymaster H. T. B. Harris, Chief Engineer A. Adamson, En-
W. F. Fullam, W. G. David and P. V. Lansdale, Cadet Midshipmen
Maloney, H. B. Andrews and H. L. Ballentine, and Cadet Engineers,

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hufeldt, Miss M. A., The Treaty with Korea, 10-11; Rear-admiral J.
Clitz to the Secretary of the Navy, May 17, 1882.

orean Letter-Book, 69-70.

orean Letter-Book, 61-74; Log of *Swatara*, in Shufeldt Papers; P. H.
er to J. M. B. Clitz, May 30, 1882, in Asiatic Squadron Letters.

W. F. C. Hasson and C. A. E. King, and preceded by the marine guard of the U. S. S. *Swatara*, under command of First Lieutenant W. F. Spicer, left the ship and proceeded to the place previously selected for the signing of the treaty between the United States and Corea, which was on the main-land near the town of Sai-mots-fo [Chemulpo?] and in full view of the ship at anchor in Roze Roads. He proceeded at once to the tent which had been put up by the Corean authorities, finding there the two commissioners on the part of Chosen, Shin Chen, president of the Royal Cabinet, and Chin Hong Chi, member of the Royal Cabinet, with their suite, and Ma Taotai, and Admiral Ting and Captain Clayson of the Imperial Chinese Navy. After a little preliminary conversation, the six copies of the treaty, three in English and three in Chinese, were sealed and signed by Commodore Shufeldt on the part of the United States, and by the two commissioners already named on the part of Chosen. As soon as the signing was completed, at a signal from the shore, the *Swatara* fired a salute of twenty-one guns in honor of the king of Chosen. Commodore Shufeldt and party then returned on board the *Swatara*.[32]

The treaty that was signed in Korea, with the exception of a slight modification of article 8, was identical with the one negotiated with Li at Tientsin.[33] The "negotiations" in Korea consisted of but little more than the sealing and signing of a document already agreed to by the three interested parties. Shufeldt gained the point for which he so vigorously contended, that the treaty should contain no recognition of the claim of China to suzerainty. Two days after the signatures were appended, he received a letter from the king, addressed to the President, which contained the following significant acknowledgment: "The Chou Hsion country (Corea) is a dependency of China, but the management of her governmental affairs, home and foreign, has always been vested in the sovereign."[34] He also received a friendly letter from the king addressed to the President, a reply to the letter of President Arthur. Both of these documents he forwarded to the State Department.

Mention must be made of the interest manifested by the Japanese in the negotiating of the treaty. On Shufeldt's arrival at Roze Roads on May 12, the commander of the Japanese gunboat *Hasio* delivered to him a letter from our minister to Japan, Mr. John A. Bingham, introducing him to Mr. Hanabusa, the Japanese minister at Seoul, with whom, wrote Bingham, I have no doubt that you

[32] Korean Letter-Book, 74-75.
[33] R. W. Shufeldt to F. T. Frelinghuysen, Aug. 23, 1882.
[34] Korean Letter-Book, 79.

will find it to your advantage "to cultivate intimate and, if need be, confidential relations." This letter called forth a letter from Shufeldt to Hanabusa. In Hanabusa's letter of reply to Shufeldt, occur the following suggestive words: "I was waiting for your arrival there [Roze Roads] wishing to speak something about our relations with Coreans, etc., but I had been obliged to enter Seoul without any delay for some urgent business, but I think I can visit you within four or five days." On Hanabusa's return to Roze Roads Shufeldt reached the conclusion that Japan regretted her declination two years before to act as intermediary between the United States and Korea, and that she was now anxious to retrieve her error. Hanabusa watched every movement of the negotiators, and "was only prevented from offering his services by the sudden and to him unexpected conclusion of the treaty."[a]

On the morning of the 24th the *Swatara* sailed for Shanghai, where she arrived on the evening of the 26th. Here the commodore was employed several days preparing translations of the Korean documents, before forwarding them to the State Department. On June 4 he arrived at Nagasaki, where he remained several weeks, hoping that an arrangement might be effected whereby he would succeed Read-admiral Clitz as commander-in-chief of the Asiatic squadron. Failing in this, he sailed for San Francisco, arriving there on July 29, 1882. As his arduous and exacting duties had impaired his health, he remained in California several months before proceeding to Washington.

The reasons for the failure of the State Department to reply to Shufeldt's telegrams present several points of interest. One cause of its failure may possibly be traced to the publication, on or about March 20, 1882, in various papers throughout the United States, of the famous Shufeldt-Sargent letter. On January 1, Shufeldt wrote a long letter to his friend, Senator Aaron A. Sargent of California, in which he spoke with great freedom of the Chinese government and people and of Li Hung Chang and the Empress. Through a misunderstanding this letter was given to the press, and its publication was exceedingly embarrassing to the administration. Frelinghuysen characterized it as an "extra-

[a] J. A. Bingham to R. W. Shufeldt, April 26, 1882; R. W. Shufeldt to Hanabusa, May 12, 1882; Hanabusa to R. W. Shufeldt, May 17, 1882; R. W. Shufeldt to F. T. Frelinghuysen, June 8, 1882.

ordinary letter, brutal in its frankness."[56] The incident naturally caused considerable coldness between Shufeldt and the Secretary of State. There seem, however, to have been other reasons for the procrastination of the department at a crucial moment in the negotiations. Shufeldt was an appointee of Blaine, between whom and Frelinghuysen no love was lost. The latter apparently was not loath to have the Korean treaty consummated by an appointee of the Arthur administration, Mr. John Russell Young, the new Minister to China. It is said that, when Young on his way to his station heard in June at Nagasaki from the commodore that the treaty had been signed, he could not conceal his profound disappointment.[57]

The Korean treaty was transmitted by Arthur to the Senate on July 29, 1882, and was ratified on January 9, 1883. Ratifications were exchanged at Seoul on May 19, and the treaty was proclaimed on June 4, 1883.[58] Already the first American Minister to Korea, Mr. Lucius H. Foote, had arrived at the capital and had been received by the king and queen with much distinction and courtesy. Before the end of the year a Korean embassy visited the United States, where many attentions were shown it by both government and people.

The Korean treaty was much more comprehensive than the initial treaties of either our own government or other occidental governments with China and Japan, which were little more than shipwreck conventions. In January, 1882, Frelinghuysen wrote to Shufeldt that if he obtained only a shipwreck convention his mission would yield admirable results. He was cautioned not to try to gain too many or too great advantages.[59] Disregarding this advice, Shufeldt negotiated a treaty of "peace, amity, commerce and navigation," quite comprehensive in character and containing fourteen articles. Among its important provisions are those permitting American citizens to trade at the open ports of Korea

[56] A. A. Sargent to R. W. Shufeldt, April 26, 1882; Secretary of the Navy W. E. Chandler to R. W. Shufeldt, June 2, 1882; R. W. Shufeldt to W. E. Chandler, rough copy, undated, probably about July, 1882; G. M. Robeson to R. W. Shufeldt, June 4, 1882.

[57] Conversation with Miss M. A. Shufeldt; C. Holcombe to R. W. Shufeldt, May 15, 1882; Korean Letter-Book, 10-11.

[58] Sen. Ex. Doc., No. 47, 48 Cong. 2 sess., p. 216.

[59] F. T. Frelinghuysen to R. W. Shufeldt, Jan. 6, 1882.

and to erect residences and warehouses therein, fixing rates of tariff, granting the usual privileges contained in shipwreck conventions, establishing diplomatic and consular representation, prohibiting traffic in opium, giving to American consuls in Korea extraterritorial jurisdiction, and granting to the United States the privileges obtained from Korea by the most favored nation.[80]

The success of Shufeldt's mission attracted little attention in the United States, indeed much less than his unfortunate letter to Sargent. Our people knew little or nothing of Korea and were not yet interested in the politics of the Far East. With the ruling powers at Washington the commodore was out of favor. President Arthur did not mention him in his message to Congress, and the State Department was none too prompt or cordial in expressing its appreciation of his services.[81] As a result of the indifference of the people and the disfavor of the government, the commodore never received the recognition in America that was legitimately due him.

Other nations, and particularly those having interests in the Far East, were quick to see the importance of his achievement. Within a few weeks after the signing of the American treaty, Great Britain and Germany made treaties with Korea, and these countries were soon followed by Italy, Russia, France, Austria and China, all of them accepting the commodore's work as a model for their own. The similarity between the feat accomplished by Perry in Japan and that by Shufeldt in Korea is so obvious that it has been frequently commented upon. One of the earliest of the comments is by a leading London journal,[82] and another by a fellow officer of Shufeldt, the commandant of cadets at the Naval Academy. "The making of the treaty," wrote that officer, "will place you in history beside Perry, and when your detractors will have long been forgotten your name will still shine brighter than ever."[83] Without attempting a comparison between the work of our two great sailor diplomats, it may be said that their

[80] For the text of the treaty, see Sen. Ex. Doc., No. 47, 48 Cong. 2 sess.

[81] Acting Secretary of State W. Hunter to R. W. Shufeldt, Sept. 6, 1882. See also correspondence in the Shufeldt Papers respecting the reception of the Korean embassy in Washington, in September, 1883.

[82] Quoted in John W. Foster's American Diplomacy in the Orient, 326.

[83] Commander N. H. Farquhar to Commodore R. W. Shufeldt, Aug. 8, 1882.

treaties are the most notable successes of the American navy in the peaceful field of diplomacy.

The opening of Korea was the consummation of Shufeldt's diplomatic career. His government, however, had still one more important duty for him to perform, the inauguration of the work of constructing the new navy. From 1882 to 1884 he served as president of the Naval Advisory Board, which had this work in charge. He also served for a time as superintendent of the Naval Observatory. He was retired as rear-admiral in 1884, and eleven years later he died, in Washington.

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THE EVOLUTION OF LEAD-LINED PIPING ON SHIPBOARD.

By Naval Constructor R. D. Gatewood, U. S. Navy.

There is probably nothing on a modern man-of-war that causes as much constant trouble both for the ship's force and the navy yard as the various piping systems. Certainly there is nothing upon which "all the law and the prophets" have so often disagreed both as to the cause of the failure of the pipes and as to the means for preventing it.

Before describing the process which is believed to be the last, or rather the latest, word toward the removal of the difficulties, it may be of interest to review the history of the corrosion on board ship of the non-ferrous metals used in these systems together with the results of some of the leading investigators of this subject.

Instances are on record in the early 18th century of serious corrosion of the iron fastenings of vessels sheathed with lead, which sheathing was accordingly abandoned and copper, with copper fastening, used in its place.

Occasional cases of serious corrosion of copper sheathing still arose and Sir Humphry Davy about 1820 conducted some experiments along preventive lines, the results of which were to show that the sheathing was perfectly protected when the ratio of its area to that of the protective metals, iron or zinc, was approximately 1000 to 1. For a while this form of protection was used but it was found that the iron or zinc required very frequent renewal and the sheathing thus protected was much more easily fouled by marine growth than when not protected, and the scheme was abandoned.

In 1832 Muntz metal replaced copper as sheathing, and for a long time there was comparatively little trouble with sheathing or

e Principal Facts Established by Early Observers.

e causes for the above observed results are the subject of controversy and the literature on the subject while volumiis contradictory and confusing in the extreme. Out of the of it all the following may be considered as the facts estab- prior to the exposition of the electrolytic theory of corro-

Corrosion is due largely to electrolytic action. (No adequate was assigned for this fact.)

Corrosion is accompanied in practically all cases by dezincifi-, that is the zinc that was in the metal is eaten out.[1]

Pitting is due to any one or all of the following causes: (1) segregation of impurities in the metal, (2) the presence of its of impurities such as carbon, lead, iron, etc., derived outside sources, and (3) the presence of stray electric cur-

Tin, when present in brass or copper in solution up to 1.5 ent, or when plated, retards corrosion.

The longitudinal grooves are due to the fact that certain ities are drawn out along the surface of the tube during the ss of manufacture.

Electrolytic copper although the purest of metal (the writer ad analyses made that show it to be 99.96 per cent pure), is readily corroded than brass or copper made by the usual ss. This is a striking fact because other things being equal, urer and more homogeneous a metal the less liable is it to sion.

Electrolytic copper should not be used in the manufacture untz metal.

When material is strained as in unequal cooling of the suror where the metal is upset and bruised as in riveting, corrois much more rapid.

Thick tubes or pipes are more resistant than thin ones.

Corrosion is accelerated by increasing the temperature of the metal or the solution in which immersed, hot sea water much more effective than cold.

The presence of air and carbon dioxide increases corrosion.

ndenser tubes that analyzed when new, tin 1.06, copper 70.36 and 8.57 per cent gave the following analysis after four years in use: 6, copper 89.6, zinc 7.4.

MEANS OF PREVENTION.

A knowledge of these facts has resulted to produce many and varied recommendations as to the best means to be adopted to prevent corrosion, the most important of which, up to about 1905, are the following:

1. The use of the more electro-positive metals such as sheets or slabs of iron and zinc in direct metallic contact. Our navy uses zinc slabs inserted in zinc boxes installed in pipe lines from 30 to 40 feet apart. A photograph of this type of box is here shown. The British use cast iron freely. This they say is equally as effective on account of better metallic contact and being much cheaper and easier to insert, which they do by means either of cast strips and rods let in among the tubes in condensers or short lengths of cast iron pipe in their piping systems.

2. The use of some form of coating to protect the surface of the metal from contact with sea water. One school of engineers and chemists advocated the use of non-metallic coatings, such as marine glue, varnish, lacquers, asphalt, porcelain and special forms of cement and wax. The best known form of this type was that called the Sabin process, named from its inventor Professor A. H. Sabin, and used extensively for several years in our navy. The process was expensive, involving as it did very careful cleaning of the pipe, dipping into a patented hot liquid coating and baking in a special oven at a constant temperature with the pipe on end. Properly applied it did protect the piping but like all other coatings of this nature, it eventually cracked, scaled or eroded off with consequent clogging of small branches, valves and strainers, and further, in those spots where this occurred the corrosive action was materially intensified. For these reasons it was abandoned.

Another school advocated the use of metallic coatings and the most common were tin, lead, and tin-lead alloys. Until the present lead-lining process was perfected it was very difficult to apply these as entirely unbroken coatings free from pin-holes that seriously increase the corrosive action. Also they were not durable owing to their slight thickness.

3. It was recommended that the tubes or pipes be kept free from foreign particles by being constantly cleaned out, a proceeding as difficult as it is expensive.

4. Every care was to be used in preventing the access of stray electric currents to the piping or tubes.

Standard Zinc Box.

5. Care was to be taken in the manufacture (1) to obtain a homogeneous mixture, (2) to prevent the presence of any impurities, and (3) to produce metal with an absolutely smooth surface, free from air holes and strains due to cooling or mechanical working.

ELECTROLYTIC THEORY OF CORROSION.

The above was about the extent of knowledge on the subject prior to the advent, about 1906, of that very satisfying theory of corrosion known as the electrolytic theory which was largely due to the researches of the American investigators, Cushman, Gardner, and Walker. It was about this same time that the present process of lead-lining was begun in earnest and since then very considerable progress can be reported.[1]

The most important additions to our knowledge of corrosion phenomena due to the application of this theory are:

1. All metals and alloys when in contact with dilute acid or water, either pure or containing salts in solution, tend to pass into solution in the form of ions.[2] This tendency is known as the solution pressure of the metal and each one has a definite and characteristic solution pressure in a given solvent which depends only on (1) the temperature and (2) the number of its own metallic ions in the solution.

2. Ordinary metals dissolve or are corroded because they are not chemically and physically homogeneous.

3. A perfectly homogeneous metal will not corrode appreciably in pure water. The reason for this will be given in a later paper. It is practically impossible to obtain an absolutely pure metal free from strains by any means now employed. It will corrode slightly, but so slightly that the amount cannot be measured. (For explanation of corrosion of pure electrolytic copper see later.)

4. Metals and alloys may with some minor exceptions be arranged in a definite order in which they tend to pass into solution. This order corresponds, interestingly enough, with the order

[1] The writer hopes to be able to describe the details of this highly interesting and now generally accepted theory in a future paper covering the latest researches in the field of the corrosion of iron and steel and, although it would be very appropriate at this place, must reserve until then an account of what has been aptly termed "the mechanism of corrosion" in the light of this theory.

[2] An ion is an atom or group of atoms charged with static electricity.

electro-positiveness of the metals and for the ordinary metals
I oxygen and hydrogen is as follows: Zinc, iron, tin, lead, drogen, copper and oxygen.

5. Opposing solution pressure there is another real pressure of siderable magnitude known as osmotic pressure, which is that to the tendency of the ions dissolved off to pass back into ir former state of metallic atoms, and may be readily pictured corresponding to the pressure of a gas on the walls of its con-ning vessel. The pressure tends thus to prevent the entrance more ions into solution.

5. A metal or alloy will be corroded by a solution that contains s of a more electro-negative nature than the metal or alloy elf. Thus, referring to the above list of metals, zinc will cor-le rapidly in a solution of copper ions, iron will corrode wly in a solution of lead ions (on account of the nearness the two metals in the electro-positive scale), etc.

7. When an ion of a metal passes into solution it takes on a sitive electric charge leaving a negative one on the corroding tal. Now this negative charge sometimes, as in the case of ter, attracts a positively charged hydrogen ion that is in the ter and tends to form on itself a plating of hydrogen which will der further action. If though there be present in the metal or ution a substance such as oxygen, or air, which will combine th the hydrogen to form water and thus remove it from the sur-e of the corroding metal, it will give up its positive charge en it thus combines with oxygen, thus neutralizing the negative arge on the zinc, another ion of the zinc will be thrown off at s point and the action will thus be accelerated. Such a sub-nce which removes hydrogen is called a "depolariser."

8. Our old conception of corrosion by means of galvanic action st thus be completely reversed. Ordinary corrosion is not imarily the effect of an electric current but is rather the *cause* the current.

9. The conceptions of solution pressure and osmotic pressure ay be likened to those of gravitation and a resisting medium in ace. By means of the two latter the theory of the formation the worlds has recently been practically solved.[1]

[1] Researches on the Evolution of the Stellar Systems. Vol. II, 1910, by ofessor T. J. J. See, U. S. N. Thos. P. Nicholls & Sons, Lynn, Mass., lishers.

By means of the two former much will be accomplished to the attainment of that other goal toward which so many minds now bent—the conservation of our national resources.

10. The new idea of the function of the impurities is (1) they act to raise or lower the solution pressure of the met (2) as depolarisers and increase corrosion, or even in the opp sense and so retard corrosion, or (3) to produce negative positive areas in the metal.

11. The rapid corrosion of electrolytic copper has not yet satisfactorily accounted for. Analysis of this copper ma Mare Island Navy Yard shows:

Iron	.02
Arsenic	trace
Lead	trace
Copper	99.97

And it would be an ideal material for resisting corrosion. most plausible theory so far advanced is that of Bengough: " copper almost invariably contains a certain quantity of hyd gas, absorbed, or in solid solution, or present in a definite pound, and the presence of this gas may, perhaps, be the ca a greater tendency to corrosion than that shown by ordinar select copper." The same investigator, however, admits th ordinary less pure copper may be protected by the prese small quantities of a protecting impurity such as tin or a

PRACTICAL TESTS OF BUREAU C. & R.

Keeping the above facts in mind it will be of interest to s results of certain practical tests that have been made.

(a) *Comparative test on three different vessels.*—In thi nection the Bureau of Construction and Repair about 1905 tuted the following test to determine the relative merits three forms of piping: (1) pure copper uncoated, (2) pure c sabined, (3) pure copper tinned. The three armored cr *Milwaukee*, *California* and *South Dakota* were fitted with fi flushing systems installed throughout in one of the above Tinning proved to be the best but when the coating once beg wear off the pipe corroded as readily if not more readily either of the others and required extensive repairs at the e 18 months. The sabined copper and the pure copper were equally bad, leaving out of account the very considerable i

ence caused to a vessel in full commission by the constant ging of small branches and valves due to particles of the ne coating.

) *Sabined copper pipe and copper pipe with iron wire le.*—In June, 1905, tests were made at the New York Navy l with copper pipe protected by the insertion of an iron wire e form of a helix in contact with the pipe. A 6-foot length of lard copper pipe 6 inches in diameter was fitted with a helix ire, size ¼ by 1/16 inch with 6-inch pitch, the end of the being soldered to the inside to avoid lateral movement. The of the pipe were flanged and blank flanges fitted. These k flanges were tapped for ½-inch galvanized-iron pipe con- ons. Sea water furnished the circulating pump of the power t was run through the copper pipe continuously by means of small end pipe connections. The test was started June 23. . On November 25 the pipes were removed for examination. iron wire had disappeared entirely except for a section about iches in length near the outer end of the pipe, which was oded so that the size was reduced to ⅛ by 1/64 inch. The ior of the pipe contained about 1 quart of muck and a thin of iron oxide remained on the inner surface. The copper was in practically the same condition as at the start, there g no loss of weight.

ie test was continued and made a comparative one between ar sections of copper pipe, one plain and the other sabined. original pipe was fitted with a new helix of iron wire and all were set up with blank flanges and 1-inch inlet and outlet as originally arranged. The new test was started on April 906. On November 9, 1906, the pipes were examined. All pipes were half filled with muck and small shells. The copper pipe showed a moderate amount of corrosion near nds, but was in good condition along the middle. The pipe d by the Sabine process was in as good condition as when lled; the interior was, however, covered with barnacles and . The copper of the pipe fitted with the iron helix was in lent condition, showing practically no pitting, but the iron had disappeared completely except for a length of about 3 s, which on being touched crumbled into rust. In view of the that the wire helix disappeared in so short a time, and to the quent impracticability of renewing the wire on board ship at short intervals, no further tests were made.

(c) *Lead-lined pipe at the Norfolk Yard.*—In 1906 experiments were made by Naval Constructor Stocker at the Norfolk Navy Yard that resulted in the present method of lead-lining. Experience with lead- and tin-lined linings had been confined to screwed connections which had proven more or less unsatisfactory at the joints. Mr. Stocker's idea was to use seamless drawn steel tubing, galvanized to increase life against external corrosion, lined with an unbroken coating of lead forced by high pressure into intimate contact with the tubing, using throughout *only flanged joints.* The success of this method was clearly demonstrated by the following facts:

(d) *Electrolytic tests of various pipes at the navy yard, New York.*—At the New York Navy Yard extensive electrolytic tests were undertaken in 1906-7 with various kinds of protected pipes. These included plain copper, sabined copper, galvanized iron, galvanized iron with zinc box, and plain brass. All the pipes were connected to a brass header at one end, the other end being blank-flanged with a small screwed outlet connection. Water was supplied the header through a rubber hose. The pipes were supported on wooden chocks insulated with sheet rubber. The five pipes were connected in parallel with a storage battery of 300 ampere hours' capacity. The voltage of this battery varied from 2 to 1.8 volts from charge to discharge, but by means of the resistance wire and the rheostats in the circuit it was possible to maintain practically a uniform current. The connection of the pipes to the header was made to resemble as nearly as possible the conditions on ship, these connections being of composition, representing the pump and pump cylinders. In each case a large globe valve was connected to the pipe at the header end. The following was the calculated division of current in the pipes (it being assumed that the resistances of the pipes remain unchanged) during the first period of the test:

Pipe No.		Amperes.
1.	Copper pipe	1.00
2.	Galv. iron pipe without zinc box	.378
3.	Galv. iron pipe with zinc box	.350
4.	Brass pipe	.608
5.	Copper pipe sabined	.191

In December, 1907, the pipes were examined and showed the following results of test: The brass pipe at the valve end had an almost continuous circle around the extreme edge of large pits

out ⅛ to 3/16 inch deep by ¼ to ½ inch long in addition to a mber of well-defined deep pit-holes, some as large as ⅛ by 3/16 h deep. The entire length of pipe had a bright surface similar brass treated with acids, due probably to the zinc of the compo-on being eaten away and leaving the bright copper lustre. The let end of this pipe was not noticeably affected. The large brass be valve lying between the pipe and header was badly eaten und the valve seat, especially at right-angles to the direction of pipe. This pitting had the appearance of wormholes about 6 inch deep by ¼ inch wide by ½ to ¾ inch long, showing ht red metal. The valve proper was not so badly affected but pitted around its contact surface. The galvanized iron pipe tected with zinc box was in excellent condition and even some he galvanizing still existed. The valve end was in excellent dition and even some of the galvanizing still existed. The valve was not affected, there being only a very thin coating of rust. re was no pitting, and the threads were in perfect condition. the outlet end there was a very slight pitting and a somewhat ker coating of rust. The pipe was in practically perfect condi- as regards pitting, although the galvanizing was, except in a places, gone. The zinc ring in the box was eaten away more n when last examined, especially where the two halves meet. was still serviceable. The large globe valve was in excellent dition. The unprotected galvanized-iron pipe was in a badly roded condition at the valve end. The thread was practically eaten away, and a coating of rust about 1/16 inch deep ex-led toward the interior of the pipe. At the outlet end the ad was in good condition, and there was only a very little pit- with only a very thin coating of rust. The globe valve leading his pipe was slightly pitted around the valve seat and around contact surface of the valve proper, but not near so badly as in case of the brass-pipe valve. The plain copper pipe at valve showed slight pitting around the edge of same, also a thin ting in spots of green oxide of copper which when scraped off wed a bright surface underneath. The other end showed htly more needle-like pitting, but no green oxide. There were ut 6 pit-holes about 1/16 inch diameter by 1/32 inch deep. e globe valve leading to this pipe was in excellent condition, re being only very slight pitting on both the valve seat and the ve proper. The sabined pipe coating was in poor condition,

especially near the ends where the pipe was nearly entirely e posed. Through the middle of the pipe the coating was in bett condition, but was broken in spots. The coating could be ea peeled off in large sheets and showed considerable flexibility. T valve and seat were in good condition. This pipe had been actual service since April 15, 1906, having been taken from former test in comparison with the pipe fitted with the iron bo It was in such excellent condition at that time that it was not sabined, but connected up with the above pipes at the start of present test on December 3, 1906.

3. There had also been connected up in parallel a length of lined with lead as per process described as in vogue at the Nor Navy Yard. This pipe had been in service from Februar December and showed no signs of deterioration.

Reviewing these tests it is evident that aside from lead-l pipe, the most serviceable and economical method for protec pipes is to employ zinc boxes in connection with galvanized-piping. In connection with this method it is to be noted that the above pipes had been in service the small composition va and fittings connected with the outlets of the pipes had to be newed because of corrosion causing bad leaks, except in the of the iron pipe with the zinc box. The outlet valve on the b pipe would require renewal before connection could agai made. The above tests indicated that the Sabine coating unsatisfactory compared with the excellent results obtained f using a zinc box, or even of employing a plain copper pipe. plain brass pipe and the galvanized-iron pipe without zinc were unsatisfactory because of excessive pitting and corro

4. On further examination in May, 1908, it was found that lead-lined pipe had suffered no injury, the lead lining bein perfect condition.

From the above it is clear that lead-lined pipe is superior t others for use on shipboard. The next in importance is vanized-iron pipe with zinc boxes. The other pipes are distin inferior.

Further test was made by installing the same length of l lined piping on the *Tacoma* in May, 1908. When examine year later it was found to be in perfect condition.

(e) *Tests on Kentucky, Kearsarge and Louisiana.*—Tl sections of lead-lined flushing pipe were fitted in the crew's l

the *Kentucky* in December, 1906, and when removed and ex-
ined in April, 1909, were found to be in good condition, with
exception of a slight deposit on the surface of the lead pipe.
ere was no sign of corrosion or pitting.

On the *Louisiana* five sections of lead-lined flushing pipe were
ed in the crew's head and one section in the fire main between
ames 9 and 11 under the protective deck, port side, in Decem-
r, 1907. These when removed were found to be in excellent
ndition with the exception of the same slight deposit as cited
ove on the *Kentucky*. Four sections of lead-lined pipe were
talled in the fire main and flushing main on the *Kearsarge* in
vember, 1906, and on examination in April, 1909, were found
be practically in as good condition as when installed, and it is
ieved that the lead lining will be good for at least five years
re. In one or two of the sections examined it was noted that
re was a slight tendency of the lead lining to draw toward the
ds of the pipe, caused, no doubt, by the expansion and contrac-
n of the pipe and lining.

The marked superiority of lead lined pipe having been thus
arly shown, it was adopted by the Bureau of Construction and
pair for all salt-water pressure piping above 1½ inches in
ameter.

DESCRIPTION OF ITS MANUFACTURE.

In repairing pipe lines brass, iron and copper piping may be
ed, but for new work lap-welded steel casing (being much
eaper than seamless drawn tubing and equally as satisfactory)
used. The inner surface of this casing is first made entirely
ooth by a revolving chain mop on a flexible spindle attached to
pneumatic drilling machine. In the case of old piping this is first
aned and the pits closed by solder, wiped off smooth, and tested
a pressure of 300 pounds.

All joints are made with flanges. When repairing a pipe having
veral different bends it is sometimes necessary to cut the pipe at
e bend and fit flanges. The flanges are counter-bored to about
inch from the face of the pipe, depending on the size of the
nge, and about 1/10 inch deep, or the thickness of the lead
hich is to be flanged over, *care being taken that the edge of the*
sing over which the lead is bent is carefully rounded with a file.

The lead tubing used is about ¼ inch smaller than the pipe to be lined. Where bends are encountered it is necessary to pull the lining through. This is done by means of a rope led through the lead tube and then through a plug and secured by a knot. The lead tubing is then filled with dry sand by means of the machine

FIG. 1.—Sand Packing Machine.

shown in Fig. 1, covered with tallow and while the outer tube is tapped with a wooden mallet, pulled through by means of the machine shown in Figs. 2, 3 and 4,[1] operated by air or water pressure at from 15 to 100 pounds pressure according to the size

[1] These machines were designed by Leadingman J. T. Murphy, in charge of the pipe shop at the Mare Island Navy Yard.

FIG. 2.—Lead-Lining Machine. Lead on Rear Table Ready to Pull in Pipe.

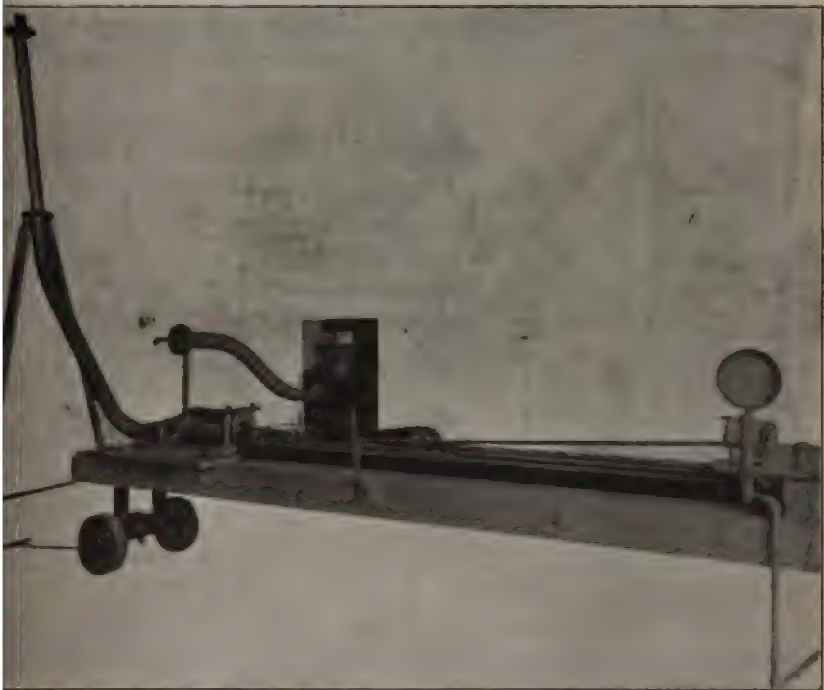

FIG. 3.—Lead-Lining Machine. Pulling Lead in 4-inch Copper Pipe.

of the bend. Bad bends are warmed slightly by means of a gasoline torch.

The plug, sand and rope are then removed and the lead examined by inserting a small electric portable. If no defects appear

FIG. 4.—Lead-Lining Machine. Pulling Lead in 4-Inch Copper Pipe.

the tubing is tapped over into the recess of the flange at one end of the pipe only. The other end of the lead pipe is sawed off about 6 inches longer than the pipe that is to be lined and the plug shown in Fig. 5 is fitted.

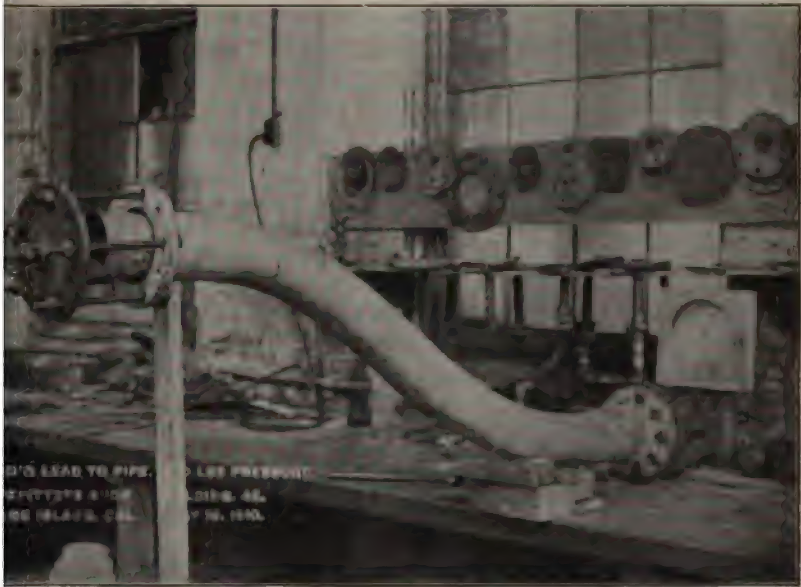

FIG. 5.

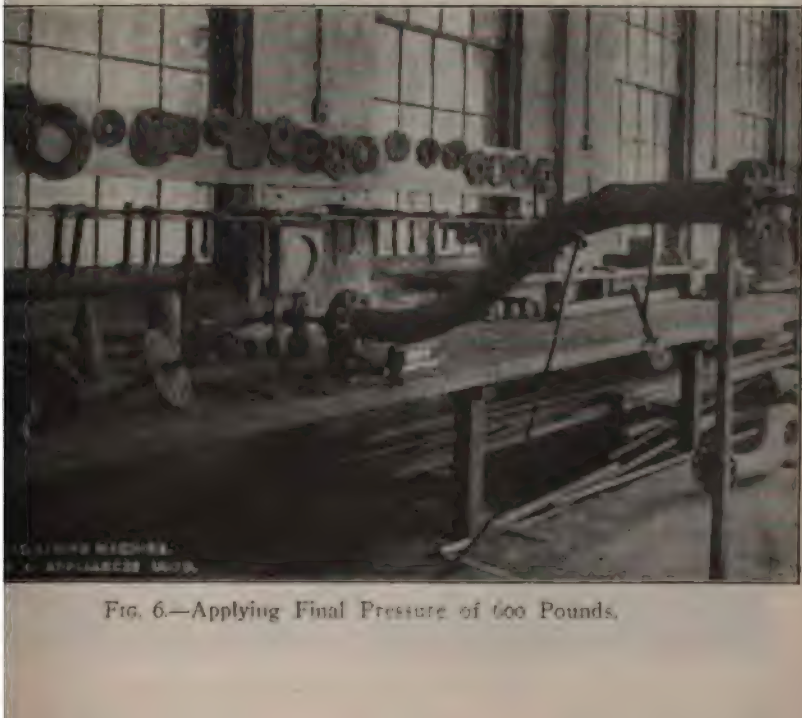

FIG. 6.—Applying Final Pressure of 600 Pounds.

The air cock shown is opened and the pressure turned on slowly. When the air is all out the plug is closed and the pressure very gradually run up to 300 pounds. The lead pipe becomes shorter under this pressure which is then removed and the lead fitted into the recess of the flange at the other end of the pipe. The piece of piping is then blank-flanged and treated to a final pressure of 600 pounds per square inch. See Fig. 6.

WEIGHT AND COST.

In order to reduce weight the lining should be no thicker than absolutely necessary. For sizes given in the following table the weight and thickness there given have been found very satisfactory:

Outside diameter of pipe.	Weight of pipe.	Thickness.
1½"	2	.088
2	3	.099
3	4	.088
4	5¾	.095

The weight of such a system is about 5 per cent less than that of a similar installation of copper piping. The cost is about 50 per cent less.

Further Points of Interest Thus Far Determined.

1. The lead piping should be shipped from the works of the manufacturer very carefully packed on wooden mandrels to prevent crushing and distortion.

2. In the case of galvanized iron, wrought iron or steel tubing the elbows, tees and other fittings are not lead lined. It has been found necessary to lead line fittings under no circumstances.

3. Old pipe has been lined with lead where the radius of the bend was twice the diameter, but it is better practice to bend the tubing to be lined to about 4 or 5 times the diameter.

4. In relining old copper pipe it is much cheaper to reline the old pipe even though it is necessary to cut out the brazed flanges and substitute flanged fittings.

5. The process does not work well on pipe above 5½ inches on account of the crushing of the lead tubing when drawing it into the steel casing.

6. Lead-lined piping is not adapted to suction pipes. The suction pulls the lead away from the walls of the steel casing.

. 7.—Showing Intimate Nature of Contact of Lining with Tube.

FIG. 8.—Samples of Lead-Lined Bends.

7. Lead-lined piping is not adapted for use with very hot water or steam service such as bottom blow piping for evaporators, on account of the large expansion in those cases.

8. Thickness of tubing thinner than that given in the above table should not be used. Considerable difficulty has been experienced on recent torpedo boat destroyers in the attempt to save weight in this manner.

9. Special care should be used to give no crown to the lead where expanded over the recess of the flange. Unless a perfectly flush surface is thus obtained it has been found that in setting up the joint the pressure comes on the lead causing it to separate from the flange recess or to crack where bent over the steel casing.

10. Several cases of severe lead poisoning have occurred at Mare Island due to the milky oxide of lead on the outside of the tubing getting into the pores of the skin of the workmen and all the usual precautions should be taken to guard against this form of poisoning.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE REPRESSION OF PIRACY IN THE WEST INDIES.

1814-1825.

By Captain Carlos Gilman Calkins, U. S. Navy (Retired).

Any tale of pirates has a far-off, romantic sound to men of the twentieth century; and neither naval nor diplomatic programs need take much account of their pursuit. It was not so when our government was organized and our navy was granted ships and men. While the Constitution awaited ratification Jefferson planned an international league to suppress the Barbary corsairs; and Madison had the same rovers in mind when he wrote in *The Federalist* of the danger that our richest port might become a hostage "for the imperious demands of pirates and barbarians." Since greater complications might follow should war begin in Europe "and all the unruly passions attending it be let loose upon the ocean," he argued that a union capable of maintaining a navy was essential for the protection of our commerce and the restraint of our citizens who might disregard the obligations of neutrality. Jefferson was in power when a squadron had to be sent to Tripoli; and Madison had to deal with the corsairs of Algiers and the filibusters of the Gulf of Mexico as soon as he made peace with Great Britain in 1815. The problems which confronted his successor involved most of the phases of his vision of 1787—which had been partially realized during the war of maritime reprisals with France at the close of the eighteenth century. The service rendered by our navy in policing the seas which skirt the shores covered by the Monroe Doctrine were a necessary preliminary to the President's declaration; and the earlier measures of repression had a direct bearing upon the rectification of our southern boundaries. The naval chronicle of the Monroe administration is therefore a significant chapter of our national history; and it is by no means lacking in picturesque pages and racy anecdotes.

Few of these can be presented in detail, since the harder task of drafting an outline of the successive campaigns will exhaust the available space. The shorter contest with Tripoli, which cost far less in life and money and had little influence upon our national development, has been voluminously discussed and romanticized. The West Indian story has to be treated in a simpler and more objective fashion. The mangrove swamps and coral reefs of the Bahama Channels are somehow on a lower imaginative plane than the northern margin of the Saharan Desert; and though the men who sailed with Commodore Porter—let it be remembered that Farragut was one of them—had their full share of hazard and adventure. But the climate was so much more deadly than the fighting, the mortality from yellow fever so much greater than that due to the malice of pirates, that a raid or a skirmish was a trivial matter in comparison with the hardships of a summer's cruise. At any rate, most of the reports are sober and modest, and even the journalists of the days failed to reap a sensational harvest. For crudely romantic treatment of the story, one may turn to the novels of Michael Scott: *Tom Cringle's Log* and *The Cruise of the Midge* abound in local color, but, as Marryat said, they are too melodramatic. The rank flavor of the Smollett tradition may account for the strict reserve with which these works are handled in the Boston Public Library, but they are sometimes misplaced among the juveniles in less careful collections. For solid fact, however, one must resort to prosaic volumes of *American State Papers*, with some help from the *Register* published by Niles in Baltimore.

I. COLONIES OF ADVENTURE IN THE GULF OF MEXICO AND FLORIDA. 1814-1819.

The rovers who sought bases for predatory operations among the islands of our southern coast were rarely professed pirates. Filibusters they might have owned themselves to be, had that term been taken in its modern sense as describing revolutionary interlopers; but to the Spaniard, filibuster and pirate still had but one meaning. Moreover, the treaty between the United States and Spain left Americans who cruised under letters of marque from any enemy of Ferdinand VII subject to the penalties of piracy. Afloat or ashore, any partisan of the revolution in Spanish America was regarded as a brigand by the royalist leaders

and punished accordingly when captured. To this Spanish custom the modern distinction between the filibuster and the pirate is doubtless due. Letters of marque from insurgent *juntas* or commissions in unorganized navies were of some advantage in our harbors, but they did not cover the sale of prizes in a neutral port. This had been decided, once for all, in the controversy about French privateers before 1800. The partisans of the independence of Spanish America were tempted to seize unguarded islands within trading distance of American towns in order to support their belligerent cruising by the clandestine sale of prize goods. Smugglers were not yet outlaws to the population of Georgia or Louisiana; but when the corsairs added cargoes of slaves to ordinary staples they encountered the statute prohibiting such traffic after 1808. Reports of the plundering of American vessels and of conflicts with revenue officials justified the national government in denouncing the interlopers as pirates, and compelled the employment of the army and navy for the suppression of their militant and predatory colonies, whether these lay within or without the recognized boundaries of the Union.

BARATARIA.

The first establishment to be broken up occupied the islands at the entrance of Barataria Bay in Louisiana. The inhabitants of the territory had lived under the government of Spain long enough to acquire the habit of dealing in smuggled goods, and slave-trading had been one of the foundations of the French colony. The facilities offered at Barataria were highly acceptable; and Governor Claiborne had little support in his campaign of repression. He could count on the loyalty of the officers of the naval station, though the first commander of the American troops had been a pensioner of Spain, and the district-attorney was too ready to defend the so-called privateers. When Commodore Porter took command of the station in 1807 he found the river open to French privateers. Acting on his own responsibility, he seized three of these by a boat expedition, and had them condemned in spite of local feeling. Prize-money was allowed, but the commodore did not find it easy to collect the reward of $60,000 which the captain-general of Cuba was said to have offered for the seizure of one of the vessels. Commodore Patterson, who commanded the flotilla and the station during the

British invasion, was as ready to act in the governor's campaign against the corsairs as in General Jackson's defense of New Orleans.

The leader of the pirates of Barataria was the notorious Jean Lafitte. History has no record of the beginning of his career, and his end also remains obscure. For one decade, however, he and his brother Pierre were men of note in the political as well as the financial affairs of Louisiana. It is said that Jean Lafitte had served in a British frigate, and this is not so unlikely as it sounds—particularly when it is added that the Frenchman deserted to become a privateer. Some of the islands of the Gulf were haunted by French rovers in 1810; and the boats of a British cruiser were beaten off at Cat Island in June, 1813. This may be taken as evidence that the British did not favor the corsairs as a means of diminishing the revenue of the United States, though that charge was current. The traffic in prize goods came to be concentrated at Grande Terre, where the Barataria Pass was closed by a bar over which only nine feet could be carried. To the northward of the bay stretched inland channels by which canoes could reach New Orleans in less time than was required to ascend from the mouth of the Mississippi; and this bayou navigation was in constant use. Regular auctions were held at the island when cargoes were brought in; and the Lafittes or their agents took orders for prize goods among the merchants of New Orleans.

The situation implied the complicity of minor officials; but the governor was always zealous against "the brigands who infest our coast." In March, 1813, Claiborne proclaimed his purpose of suppressing a combination of banditti of different nations which had armed vessels "for the avowed purpose of cruising on the high sea and committing depredations and piracies on the vessels of nations at peace with the United States, and carrying on an illicit trade." Unless the rovers were deprived of their "ill-gotten treasure," Louisiana would be forever dishonored. A few months later he declared that the smugglers were "setting the government at defiance in broad daylight" by running in contraband goods. When some of these had been captured they had been retaken "by a party of armed men under the orders of one John Lafitte"; and a warrant for his arrest remained unexecuted. A custom-house inspector who ventured to Barataria in search of

a cargo of slaves was killed in fight, and twelve of his posse were held as prisoners.

Governor Claiborne then offered a reward of $500 for the arrest of the principal offender; and Lafitte replied by promising $15,000 for the delivery of the governor's head. Claiborne resolved to recruit troops for attacking Barataria; but his appeal to the legislature failed to procure a grant of funds, though he urged that the corsairs had destroyed the trade between Vera Cruz and New Orleans. Legal process was of little effect: both the Lafittes were indicted for violating the revenue and neutrality laws—it was hopeless to think of convicting them of piracy; and Pierre was actually arrested on one of his visits to New Orleans. The slave-trade had not yet been assimilated with piracy; but the report that the Lafittes—who seem to have been brokers for the corsairs rather than active privateers—were about to smuggle in 415 negroes, taken in a Spanish prize and valued at $170 per head, showed the magnitude of their offenses. Yet it was almost hopeless to send such cases before a jury; and the defection of the district-attorney was also a hindrance to the course of justice. He resigned to assist Edward Livingston in defending the outlaws, tempted, doubtless, by a fee of $20,000 which he went to Barataria to collect; and he shot his successor in a duel for venturing to condemn his unprofessional conduct. It was not easy to hold any of the clan in prison; but Pierre Lafitte was a captive for several months in 1814; and this may account for the patriotic spirit manifested by his brother when urged to make war on the Americans.

On September 2, 1814, a brig of the British navy anchored off Barataria, and a curious message from the commanding officers of the naval and military force which had invaded Florida was delivered by Captain Lockyer, R. N. Colonel Nicholls invited the commandant of Barataria to enter the British service with the rank of captain, to cease all hostilities against Spain and other allies of Great Britain, and to place his vessels under the orders of British naval officers, promising a guarantee of his property and the protection of his person. The truculent colonel added that he meant to "cut out some other work for the Americans than oppressing the inhabitants of Louisiana," who were invited to "assist in liberating from a faithless and imbecile government your paternal soil" by helping Great Britain to attack the only

enemy she had in the world. Lockyer's instructions from the local commodore required Lafitte to restore certain British property which he had taken if he wished to save his vessels and his town from immediate destruction; but liberal offers were attached to this warning: the rovers might serve afloat or ashore, or remain neutrals at their choice, all British subjects among them receiving a free pardon for past offenses. The "blessings of the British constitution" and grants of land were promised to all who might care to emigrate; and a verbal offer of a reward of $30,000 seems to have been made to Jean Lafitte. The corsair appeared inclined to yield to temptation, but his followers were eager to arrest the British envoys as spies. After a diplomatic delay Lafitte also resolved to seek an American alliance by sending the originals of the seducing letters he had received to the authorities at New Orleans. He asked Governor Claiborne to relieve the Baratarians from proscription, declaring that his vessels had made "perfectly regular" cruises under the flag of the republic of Cartagena: "If I could have brought my lawful prizes into the ports of this state, I should not have employed the illicit means which have caused me to be proscribed." Not long before Lafitte had said that he would rather risk his life than give up his goods, but events had moderated his resolution.

His submission was not acceptable to a council of the principal officers of the army and navy at New Orleans; and the governor was advised to hold no correspondence with "any of those people." General Jackson appealed to the inhabitants of Louisiana in a proclamation of September 21 to reject all offers from "these noble Britons," who had "courted an alliance with pirates and . . . . dared to insult you by calling upon you to associate as brethren with these hellish banditti"—bitter words which the general must have regretted before the end of the year.

Meanwhile an expedition was dealing with the adventurers of Barataria. Commodore Patterson armed a flotilla and took on board a detachment of the army under Colonel Ross in time to sail from the South Pass on September 15. His force was made up of the U. S. Schooner *Carolina*, six of the Jeffersonian gunboats, and three barges. Arriving off Barataria on the morning of the 16th, shipping was sighted in the bay behind Grande Terre; "at 9 a. m., perceived the pirates forming their vessels, ten in number, including prizes, in a line of battle near the entrance." Since the *Carolina* could not cross the bar, the comm-

had to shift his flag before standing in with his flotilla of sail. He saw them making smokes as signals, and doubtless l for a brisk action. But he soon saw that the largest oner had hoisted the white flag at the fore, the American en-at the main, and the flag of Cartagena, or Colombia, at the topping-lift. Standing in under flags of truce, the Ameri-discovered that two of the enemy's best vessels had been ; whereupon the white flag was replaced by the signal for . A pennant inscribed "Pardon for deserters" was hoisted se of rumors that men of the army and navy had run away in the pirates. Neither signal realized the commodore's tations; he could only report finding, "to my great disap-nent," that the rovers had abandoned their vessels and fled directions. Colonel Ross landed to burn the 40 palm-ed huts of the colony, finding 20 guns mounted ashore and ice that nearly 1000 men had belonged to the community. *'arolina* had her reward when a large schooner appeared in fing; the fact that she was ready to oppose the American ron justified her capture, in spite of her Colombian colors. ogether eight prizes were brought to New Orleans after hing afloat or ashore had been collected or destroyed; it stimated that the ships and goods were worth $500,000, and were duly filed for prize-money. The commodore re-l that this blow to the pirates would "prevent their ever ting again in force sufficient to injure the commerce of this ' Governor Claiborne informed the Attorney-General of the d States of the "entire dispersion of the pirates and smug-and the capture of nearly all their vessels"; but he urged n view of the general sympathy for all sorts of contraband , that the district-attorney might be instructed to "select of the most hardened of the Baratarians for trial and to for-o prosecute all others concerned."

s program would hardly have tempted Lafitte and his cap-to renounce the British alliance and assist in the defense of Orleans. Yet before the crisis of January, 1815, there had a friendly interview between General Jackson and Jean e in the batteries below the city; and the fateful morning of ry 8 found some of these works manned by guns' crews y "Captains Dominique and Beluche, lately commanding teers at Barataria." The naval detachments who fought ent batteries received no higher praise than the general

bestowed upon "these gentlemen" for "the gallantry with which they have redeemed the pledge they gave at the opening of the campaign to defend their country." The brothers Lafitte were expressly commended in this order of January 21; "and the General promises that the government shall be duly apprised of their fidelity." Nothing could be refused to the defenders of New Orleans, and the President complied with Jackson's covenant by issuing a general pardon for the men of Barataria. Jean Lafitte is said to have gone to Washington and to have spent most of his wealth, probably in opposing the claim of Commodore Patterson and his squadron for the proceeds of their capture at Barataria. It is to be hoped that the officers and men of the navy got some reward for the Barataria expedition, since their fortunes had been hard between that event and the day when they fought in the batteries alongside the rovers whom they had regarded as pirates and "hellish banditti" a few months ago. The only resistance which the British advance encountered before landing within six miles of New Orleans was that offered by the Jeffersonian gunboats, which were captured in Lake Borgne, and the *Carolina*, which was burned by hot shot in the Mississippi River.

Lafitte and his comrades could hardly venture to renew operations while a British fleet dominated the gulf; and few ports were open to privateers sailing under the Colombian flag in 1815. Cartagena had been recovered by Spain, and the Mexican insurgents had no harbor on the coast of the Gulf. They had even lost Acapulco; and their corsairs had to be manned and armed in neutral ports. Even the black king of Hayti warned all marauders away from his coasts; he would hang all pirates without fail, "let them call themselves what they will, Cartagenians, Englishmen, Frenchmen, or Spaniards." The cessation of war on both sides of the Atlantic added Americans to the category denounced by King Henry; such adventurers as Lafitte could not be debarred from practising their profession; and new squadrons of corsairs were soon seeking markets and harbors of refuge adjacent to the shores of the United States.

GALVESTON.

Though this establishment was a virtual revival of the Baratarian enterprise, the Lafittes held no military command in Texas during the first year of its notoriety, preferring to act as agents

for the sale of slaves and other spoil in New Orleans. The commandant at Galveston was known throughout the West Indies as Commodore Aury, though it was never clear whether his authority for any particular capture was derived from Mexico or Colombia. This rover is said to have been a Parisian, who, after serving in the squadron under the command of Jerome Bonaparte which the British forces blockaded until its organization was lost, had joined the insurgents of Cartagena either as a naval captain or privateer. He had previously served under a commission from Victor Hugues, the Jacobin who held Guadeloupe for Napoleon until 1810. He was able to bring two well-armed cruisers into the Colombian service; and he is said to have preferred to attack Spanish men-of-war instead of pursuing his regular trade as a commerce-destroyer. He may have had political aims which were not to be reconciled with those of Bolivar; and after two or three years' service he withdrew from the Colombian navy to ally himself with the rovers of the Gulf of Mexico.

The Mexican leaders had sent an envoy to the United States in 1816; but Herrera got no farther than New Orleans, and thus never acquired diplomatic standing. In fact he reverted to his allegiance to Ferdinand VII in 1818—before the privateering colonies founded under his commission had ceased their activity. He was persuaded to visit Galveston and to appoint Aury civil and military governor of Texas; and an admiralty court was installed to deal with prizes taken by the corsairs in the name of the Mexican republic. The collector of customs at New Orleans reported that the negroes whom Aury had brought from Hayti in his schooners had been reinforced before 1817 by many French and Italian mariners who had been "hanging loose upon society in and about New Orleans ever since the breaking up of the establishment at Barataria." Pardon had not cured these vagabonds of their inclination for plunder; they seemed to regard the government's indulgence "almost as an encouragement to the renewal of their offenses." For the neutrality of Louisiana they cared nothing: their system of plunder drew all its resources from New Orleans, where they had been allowed to "enter in distress, augment their force, and renew their crews." The Lafittes were named as principal supporters of the Galveston trade and owners of several privateers; but other citizens were said to be equally guilty in both particulars.

The collector was able to name six vessels which cruised under Aury's commissions, and to enumerate their prizes during the summer of 1817. Slavers were the most profitable captures, since negroes could be sold for a dollar a pound, or about $140 per head. No less than 650 slaves are said to have been in stock at one time, though having found a cargo of 300 infected with a contagious fever, the pirates cut the ship's cable and set her adrift in the Gulf.

Aury may have tired of consuming the proceeds of his prizes and employing his ships in the service of the Mexican revolution. At any rate, after a short cruise in support of General Mina, the "student Mina" of the Peninsular War, and a brief occupation of Matagorda, he determined to abandon his Texan dominions; and before the summer of 1817 was over his squadron of 13 vessels, corsairs and prizes, sailed for the east coast of Florida. The huts at Galveston had been burned and the mud fort dismantled when Aury removed to Matagorda; but the island remained a rendezvous for the pirates for the next three years.

Jean Lafitte, duly equipped with a Mexican commission, took the place of Aury; and by the end of 1817 no less than a thousand freebooters had rallied under his flag. He built a red house on the ruins of Aury's post, entertained lavishly, wore a green uniform, and fought the Indians of Texas when they attempted retaliation for the buccaneering practice of carrying squaws to the island. Those merchants of New Orleans who traded with Mexican ports sent a petition to Commodore Patterson asking convoy for their shipping: cupidity had rallied the freebooters of the gulf and their vessels under the flags of Buenos Ayres, Venezuela, and Mexico, who "pretending to have commissions from the constituted authorities there to cruise against their enemies, but manned with renegado crews of all nations, have lately commenced the plundering of the vessels of your memorialists, sailing under the flag of the United States on lawful voyages, and rob them of whatever specie they find on board." This petition doubtless went to Washington along with the collector's reports, and the new administration found itself compelled to act against the piratical interlopers.

President Monroe's first annual message declared an intention of suppressing the colonies of adventure without much regard for the territorial limits claimed by Spain; and he intimated that Galveston might be regarded as belonging to Louisiana, a proposition

ch was not decided in that generation. A committee of Con-
s considered that part of the message and described the com-
ity at Galveston as an association for plundering on the high
Spanish property was the objective, but vessels of any
onality which carried specie or other goods of great value
e also liable to pillage. The Mexican flag was used, though
connection was doubtful; the presumption of any authority
such an establishment was "repelled as well by its piratical
acter as by its itinerant nature." John Quincy Adams, the
etary of State, discussed the situation with his usual austerity;
ing on December 29, 1817, he referred to "that buccaneering
piratical spirit which has lately appeared among the South
ricans, not of their own growth, but I am sorry to say, from
contamination of their intercourse with us. Their privateers
been for the most part fitted out and officered in our ports
manned from the sweepings of our streets." Naturally he
ludes that the President could not delay action against their
s of operations.

he Spanish minister at Washington noted with alarm the
sident's announcement to the effect that, as Galveston fell
in the limits of Louisiana and had been occupied by vaga-
ls who commit piracy and injure the trade of the United
es, he has taken measures to correct these abuses. But, Don
de Onis protested, Galveston had never belonged to Louisiana.
its evacuation by the freebooters had been brought about by
royal army which had captured Matagorda and driven them
y. Foreign intervention was inacceptable, though Spain's
s by the pirates had been far greater than those of the United
es. Galveston had been made a magazine for goods taken from
niards and these had been purchased by American merchants
hipment to New Orleans or other ports of the United States.
hether Monroe and Adams were restrained by the Spanish
onstrance during the negotiations for the purchase of Florida
scouraged by the lawless habits of the Louisianians does not
ar; but Lafitte and his company had three prosperous years
re Galveston had to be evacuated. In August, 1817, there
a dozen privateers in the Mississippi River, half of them
g the Mexican flag under Aury's commission, and the rest
of Colombia under warrants from Bolivar. The Lafittes
with all of these, making this illicit trade their only occu-
on, threatening officials, and setting the laws at defiance. An

eye-witness of their doings at Galveston testified that their sole object was "to capture Spanish property, under what they called the Mexican flag, but without any idea of aiding the revolution of Mexico or that of any of the Spanish revolted colonies." In fact, the government of Galveston "had no connection with that of any other nation, state or people." Yet some forms of law were observed; there was an admiralty court to condemn prizes, and a gallows for pirates who were refractory to Lafitte's discipline.

Thus when the U. S. Schooner *Lynx* approached the bar on November 8, 1819, her commander saw "a gibbet on the point of Galveston with a man hanging"; and he was informed that the victim was one Brown who had robbed an American vessel on the coast of Texas and had been pursued by the *Lynx*. In the version printed in various journals, Lafitte's first letter appears to have required Lieutenant Madison to explain "the reason for your lying off this port without communicating your intentions," and warned him against trying to enter in a hostile manner. Lafitte added that his disposal of Brown proved that he was no abettor of piracy but a governor who respected the law of nations. Madison wrote to the papers—men of his profession had that unfortunate habit in that generation—to say that Lafitte had written in a different tenor; but there is no doubt that he replied by urging Lafitte to continue the good work by arresting other pirates whose names were set forth, and closed with thanks for a courteous invitation to visit Galveston. That privilege fell to Lieutenant McIntosh, who testified that he had enjoyed "most friendly, generous and hospitable" treatment during a three days' visit at Lafitte's headquarters—where there was doubtless an abundance of the materials for conviviality, though it might not be reckoned civil to inquire how they were purveyed.

The visit of the *Lynx* must have alarmed the confederates at Galveston; and Pierre Lafitte filed on January 3, 1820, an offer "to clear Galveston and disband its inhabitants," with a pledge from both brothers that it should never again become a rendezvous for persons cruising under their authority. This proposal recognized the jurisdiction of the United States as extending to the Rio Grande; and its ostensible object was to rescue the name of Lafitte from the contempt due to its association with "the criminal undertakings of a gang of pirates of all nations," whose "depredations and atrocities" were committed within American territory. The letter was addressed to the commandant of the naval

tion at New Orleans, who was told that all that he had to do restore confidence among those engaged in foreign trade from w Orleans and rid the gulf of "cruisers obnoxious to the ernment" was to issue the necessary permit for the depar e of Lafitte's followers. A month later Commodore Patter authorized the occupants of Galveston to "depart therefrom h their vessels, arms, goods, and furniture, and whatsoever may to them belong"—all their plunder, would have been a fer formula—to such places as they might select outside the isdiction of the United States; and the commanders of vessels ched to the station were instructed to respect this permit, pro ed the corsairs respected the shipping of all allies of the United tes during their passage.

Patterson further specified that the defenses and buildings of lveston should be razed to the ground, and "every means be noved from thence which has hitherto rendered it the retreat l security of pirates" and other disturbers of traffic. The *nx* visited Galveston on June 19; and Lieutenant Madison re ted that Lafitte had evacuated the island some weeks before, ning all his houses according to contract. A rich prize had sequently been brought in, abandoned, and run ashore; and ne of her goods were buried among the sand-hills. This corre ndence and its sequel seem to have been unknown to the best torians of Texas and Louisiana, though preserved in the ords of the navy.

afitte had to take to the sea at last; and he was somewhat uely reported as a leader among the pirates who were fighting plundering on the coast of Cuba in 1822. Two years earlier status as a pirate was ascertained by the conviction of three of men for piracy in robbing a Spanish vessel in the Gulf. This lict of the federal district court at New Orleans was rendered fective by pardons from the President; and men thus restored heir friends were robbing American vessels in 1821. One of itte's vessels was surrendered at New Orleans in 1820, the v having mutinied and marooned their officers. In this year the district court of the United States at Norfolk restored to Spanish consul certain bales of cochineal which had been taken an American captain in a cruiser hailing from Buenos Ayres. court accepted the plea that no American citizen could law ly take prizes from the Spaniards, whether he cruised as a vateer or an officer in the Argentine Navy, basing this rule upon

our treaty with Spain. The decision was affirmed by the Supreme Court, though the doctrine was less clearly stated in the final decision. No obligation to punish the perpetrators of such seizures as pirates was established by the treaty; but had its provisions been applied to prize-goods brought to New Orleans by Lafitte's corsairs his profits would have been scanty.

It has been related that Jean Lafitte died in Yucatan in 1826, just as piracy was going out of fashion; but his end remains as obscure as his origin. In spite of his care in procuring commissions against the Spaniards and his care to avoid conflicts with the United States Navy, Lafitte must be rated as a pirate rather than a filibuster, since he robbed only for personal gain. He had little care for the public welfare of any of the countries he adopted, and, being a broker rather than a corsair throughout his career, he did nothing to make buccaneering romantic. Whatever he was, his record offers little enough for the purveyor of retrospective romance or melodrama. Yet he must take his chance with his betters in the hands of those who write for the market.

AMELIA ISLAND.

The predatory stations along the gulf coast had been located with reference to the market afforded by New Orleans and the plantations on the banks of the Mississippi. For traffic with the frontier towns of Georgia a station in eastern Florida was requisite, and such a colony of adventure might command the navigation of the Bahama Channel, the outlet of commerce by the flotas and galleons ever since the set of the Gulf Stream had been discovered in the sixteenth century; and the Huguenot strategists who planted a colony on the banks of the St. John had intended to reap a rich harvest along that track. Pedro Menendez put an end to that undertaking by the massacre of Jean Ribaut and his men in 1565. Had not the British occupation of Florida after the Seven Years' War terminated in 1783 the commerce of the West Indies and the gulf would have been subject to arbitrary control. The Spanish domination was a matter of less significance to the United States; but it proved inconvenient to have the Florida coast open to the establishment of roving colonies.

The first interloper who demonstrated the weakness of the Spanish garrisons in 1817 was Sir Gregor MacGregor. This

of a clan whose very name had been proscribed in the days ob Roy, was the typical adventurer of the restless generation h saw the close of the Napoleonic wars. He had served in Peninsular War in the British or Portuguese army before he to the Spanish Main with Miranda and allied himself with var; and his rank of general in the Colombian service was won ard fighting. But the patriots persisted in regarding him as eigner in spite of his record and his marriage with a lady of Liberator's kindred; and MacGregor resolved to start a de- ed revolution to make Florida the eighth republic of Spanish rica. He found certain Spanish-American commissioners in adelphia, and they granted some sort of a warrant for his rprise. His troops were recruited in Charleston and nnah, with the understanding that Florida was to be ceded to United States at a convenient season. This force was sufficient rocure the surrender of Fernandina by the Spanish com- der; and MacGregor proclaimed his intention of hoisting the n cross of Florida—his newly devised ensign—on "the proud s of St. Augustine"; but that town was held by a resolute nish governor. Authority for blockading the coast was ned "under the commission of the supreme governments of ico" and other republics; and the privateers were described naval force adequate to its maintenance. Grants of land in erritory to be conquered were also offered to those ready to rd money or life in this enterprise. Altogether, MacGregor nearly a thousand men when his two schooners and his flotilla d from Darien, Georgia; and Amelia Island was in his pos- on on July 9, 1817. The event had more notoriety than its nsic importance justified; and random adventurers of all ons were soon heading for Fernandina.

he first reinforcement came in a schooner owned by Ruggles bard, a politician who had been made sheriff of New York by rrupt bargain; and his resources were sufficient to compel Gregor to admit him to a share in the government. A Colonel n of Vermont was made treasurer of the island; and bills d upon expectations of plunder were put in circulation. The rnment was prepared to collect a tariff on imported goods, vell to levy admiralty dues on the proceeds of privateering. re was force enough to beat off a Spanish attack on Septem- 3; but the financial situation was desperate.

3

MacGregor resolved to cross to New Providence to seek money and supplies; and Hubbard lent him a schooner for the voyage. The American contingent thus held control when the arrival of Aury and his squadron from Galveston transformed the situation. MacGregor tried to bargain with the Frenchman; but Aury would take no lower place than that of commander-in-chief, though Hubbard was allowed to call himself civil governor for a season. The green cross of Florida was hauled down, as Aury declared that MacGregor never had any commission whatever for his conquest, and the flag of Mexico was displayed, as at Galveston. This revolution was but the beginning of Governor Hubbard's tribulations: and he must have regretted the difference between politics in New York and his adventure in Florida. Aury left no authority in the hands of the civil magistrate, and all opposition was silenced by the landing of a guard of 130 brigand negroes, "a set of desperate bloody dogs"—probably Haytians hardened to revolutions. Hubbard tried to intrigue for the cession of Florida to the United States, offering everybody promotion and Aury a commodore's commission in the American Navy. The filibuster refused and paraded his black troops to force Hubbard to give up his authority; and thus the deposed leader was driven "to an act of intemperance which soon terminated his existence," or, as Aury related, "died under the agonies of his crimes," when his plots were detected.

This left the American party without a leader, Colonel Irwin, though he had been a member of Congress, proving incapable. The English-speaking element was soon strengthened by the arrival of some thirty officers, many of them Scotch or Irish, who had served in the wars with France and had been engaged to serve Venezuela with increased rank and pay. Upon arriving at St. Thomas they were discouraged from proceeding to South America, and rumors of MacGregor's conquest tempted them to sail for Florida. Aury was not inclined to welcome so many officers, and he tried to send most of them to Venezuela to seek employment. He had one restless Englishman brought before a court-martial made up of privateering captains for trial "under the naval code of the United States." Counsel for the accused found his objections overruled, and he ventured to warn the members of the court that he would "forward their names to the different governments of which they are still subjects, and ... draw upon them the punishment which their contempt of justice

ved." Naturally, the prisoner was found guilty—and ban- from the republic, which his defender also had to quit. 's faction was strengthened by the arrival of a party of hmen, veterans of the *Grande Armeé* for the most part, who een recruited on the same terms as the British contingent. had sailed from Charleston for Amelia Island as soon as heard that their compatriot had won the command; and nandant Persat, a truculent survivor of the Napoleonic wars, old how he organized the French troops as Aury's chief-of- The crisis arrived on November 16, when Persat drove Americans from their block-house and captured their two panic preventing any effusion of blood.

ry did not long retain the supremacy he had won. Florida to be the subject of international discussions; and President oe coupled Amelia Island with Galveston as establishments violated our laws and threatened our commerce—and there- had to be suppressed. There were precedents for the seizure nelia Island: it had been the rendezvous of smugglers after enewal of the Jeffersonian embargo or non-intercourse act 09; and its occupation had been ordered as a means of pro- g the revenue. Congress had enacted in 1811 that the Presi- might seize any part of the Floridas to prevent foreign in- n; and Pensacola and other places had been held during the f 1812 by American as well as by British forces, though the f 1811 was kept secret until after it had been determined pel Aury from the borders.

expedition was organized under the command of Captain ey, U. S. N., and Colonel Bankhead, U. S. A., and the island ummoned to surrender on December 22, 1817. With troops gh to garrison the island, backed by the guns of two sloops- ar, there could be no doubt of the result. Aury declared that ld the conquered island with all the rights that could pertain y government: and that he was not aware that the United s were at war with any of the republics which had revolted Spanish authority; "Are you acting in the name of the of Spain or his allies? We cannot admit that you have ly arrived at such a point of degradation." But his con- n was that if the officers persisted, "we respect and esteem ighly the people of the United States to proceed to extremi- The island therefore capitulated on the 23d. The American nodore's anxieties were not yet over, however: he had given

the Frenchman a month to collect his archives; and at the end of a week he reported, "I am fearful that Aury and his followers will give us much trouble before they quit the island. I am sorry to add that the Americans appear to be much worse than any other." Elsewhere the followers of Hubbard are described as rabble from the streets, by no means fit to contend with Aury's negro brigands, whose color caused so much apprehension throughout the southern states.

Aury was arrested in Charleston in March, 1818, for the capture of a Spanish brig on the high seas; but the district court declined to assume jurisdiction over prize cases occurring *flagrante bello*. That Aury was not an American citizen was indicated by this decision as well as by the fact that he was then trying to negotiate with the government by sending a Peruvian diplomatic agent to Washington. Don Vicente Pazos represented Aury's command at Amelia Island as a regular government, though it had only lasted twenty days after the overthrow of Hubbard; and he gave an interesting abstract of his principal's service in promoting the independence of Spanish-America. But he found the case closed before his appearance in Washington.

The President had sent a special message to Congress on January 14, 1818, reporting the suppression of the establishment at Fernandina and arguing the case against the adventurers with some vigor. They had dealt in everything contraband, and their conduct in regard to slaves had been "of the most odious character," causing injury and annoyance to the United States—that is, as stated in an earlier message, the island had been made "a channel for the introduction of slaves from Africa, an asylum for fugitive slaves, and a port for smuggling of every kind." The adventurers were not natives of Florida or, for the most part, of any of the countries they had set out to revolutionize; and their assumption of sovereignty threatened encroachment on territory belonging to Louisiana, as well as the conquest of Spanish possessions. Monroe's arguments were expanded in the report of a committee of Congress, as if in anticipation of protests from all concerned; and much was said of "the timely interposition of the naval force under direction of the executive" to break up an itinerant combination of foreign adventurers. The forms of free government had been "prostituted by a horde of foreign freebooters for purposes of plunder," and it was necessary to deprive them of their place of refuge.

ie President had pointed out that Spain would be responsi- or the mischiefs done by these interlopers were it not mani- that, although committed through her territory, she was ly unable to prevent them; and he had denied any intention of ng conquests of Spanish possessions—or of injuring the : of the revolted colonies. But before the Spanish minister ime to file the inevitable protest General Jackson had invaded da in pursuit of Indians and those whom he called "land es," meaning certain Englishmen who, in pursuance of Mac- or's projects or others of the same type, were intriguing ig the Indians; and Spanish sovereignty had hardly survived hock of his operations. Nevertheless, Onis insisted in July, that, as MacGregor's expedition had been recruited and d at Charleston and Savannah, there was "no just ground onverting into an act of hostility or detriment to Spain the resulting from the toleration of such armaments in the for the invasion and plunder of the possessions of a friendly r." John Quincy Adams, who found arguments to justify Jackson's arbitrary conduct, told the minister that Spain hardly expect the United States to defend her territories or e them from adventurers for her exclusive advantage. It still urged in behalf of Spain that the United States ought to nt all hostile armaments in her ports against the commerce possessions of Spain, either by Americans or adventurers of ther nation, or by the rebels of Spanish America; and that rates found in American waters should be arrested and their restored to its Spanish owners. The treaty for the cession orida was signed by Adams as Secretary of State and Onis inister of Ferdinand VII on February 22, 1819, thus dis- g of the affair of Amelia Island. Other controversies were nation in the ninth article, the United States renouncing "all s on account of prizes made by French privateers, and con- ed by French consuls, within the territories and jurisdiction pain"; and against these were set off "all injuries caused e expedition of Miranda, which was fitted out and equipped ew York," as well as certain unlawful seizures at sea or in rican ports, thus condoning filibustering in retrospect.

acGregor was expected to invade Florida in 1818 to found a y of adventure at Tampa Bay; but he failed to find the re- es for that enterprise. In December he sailed for the Carib- at the head of a new expedition. Making Hayti his base

of operations, he occupied the islands of St. Andrews and Providence, which had been formidable rivals of the settlement of Massachusetts Bay about 1640, when they were colonies of adventure under the control of the leaders of the Puritan party in England. To these isles MacGregor invited privateers of all nations; and Commodore Aury soon brought his black troops to the rendezvous; and Persat relates he died at Old Providence about 1819—though another story has it that he dwelt in Havana until 1845. His great wealth was divided among his French followers—millions of francs which he might have taken home to Paris had he not resolved, Persat reports, to found a republic of which he should be the head. Aury was, however, less addicted to fantastic adventure than his colleague. MacGregor took Porto Bello in April, 1819, but his followers fell sick or deserted, after trading cartridges for rum; the place was soon recaptured; and MacGregor only escaped by swimming off to his flagship. He then got a concession for some fifty millions of acres on the Mosquito Coast; and described himself as "His Highness Gregor, Cacique of Poyas," when he went home to recruit colonists and raise money. The Highlanders whom he carried to Nicaragua died miserably; and the borrowed funds were never repaid. In his old age, MacGregor had occasion to recall that he was after all one of Bolivar's lieutenants and a general in the Colombian army; and he got his rank recognized at Bogotá. He did not long enjoy his retired pay, but died in obscurity some twenty years after his last venture as promoter of privateering.

II. The Later Piracies of the Antilles.

When the corsairs lost their last refuge on the gulf coast the merchants who traded to the West Indies may have counted upon a season of comparative security. Although the revolt of Spanish America still gave Spain and half a dozen republics full belligerent rights there were many openings for legitimate traffic on the main and among the islands. Five years after the end of the great war in Europe and the small contest between Great Britain and the United States it might have been anticipated that the seas would have been policed, and that most of the privateers would have found other employment. But Spain could do little to protect her own commerce, since her navy had not recovered from defeat, and many officers had been granted leave to earn a living

fishing. The purchase of a squadron from Russia proved a bargain, and no effective force could be sent to the West ies. Yet the Spanish government proclaimed a paper blockade he coasts of the main; and in default of regular cruisers, pri-eer coast-guards were armed in the Antilles and sent out to rcept all vessels suspected of breaking the blockade. Irre-nsible captains abused the right of search and strained the trine of continuous voyages and contraband to make captures. e corsairs commissioned in the name of the new republics—ny of them by exiles or pretenders to authority—were so fre-ntly commanded by American seamen that vessels under the g of the United States were generally respected, even by the st unscrupulous of the rovers, men hardened by privateering the slave trade.

The two classes of corsairs for which Spain might be called to ount, were, according to an official despatch by John Quincy ams in 1823, "privateers . . . distinguishable from pirates only commissions of the most equivocal character who committed rages which no commission could divest of their piratical char-er and piratical vessels belonging to Cuba which went to sea hout pretence or color of commission." The latter were avowed as pirates by local authorities; but they were hardly dis-guishable from the licensed privateers, especially when they ld purchase connivance by sharing their spoil with merchants magistrates. Americans were generally detested in the islands ause their government had allowed so many of them to serve supply the revolutionist of Mexico and the main; and suc-sive revolutions in Spain prevented the adoption of any con-ent policy for maintaining diplomatic or commercial relations h the United States.

THE COAST OF CUBA.

By the end of 1819 the mercantile community of the United tes had to protest against the conditions which had led to the ndering of 44 American vessels in one year. The evil was cribed to defects in the law of nations or to the laws not being orced" by the president of an insurance company in Boston, re Webster and Channing were then supporting an appeal the suppression of all forms of privateering, since men were s led "to shed blood for no other ends than private gain." The sairs licensed in South America, some of whom had four com-

missions from different rulers and thus escaped all responsibility, took prizes on our Atlantic coast with little regard for their nationality. The slave-traders proscribed by previous statutes were in 1819 made liable to the penalty of piracy, and the definition of that crime was otherwise extended by Congress and the Supreme Court, which ruled in 1820, with reference to a privateer commissioned by Aury, that no person sailing from a port of the United States under commission from a belligerent is protected from punishment for any offense committed against vessels of the United States, and that the offender had committed piracy. The Admiralty of Great Britain had already instructed captains cruising in the West Indies concerning "divers piratical acts and outrages against the vessels and goods of his majesty's subjects" under color of hostilities between the King of Spain and the revolted provinces, and had ordered that offenders in this kind should be sent in for trial wherever there was a competent court in any British possession.

The Pacific was not free from these evils. Sir Thomas Hardy and Captain Ridgeley of the U. S. S. *Constellation* had occasion to act against piratical establishments at the islands of Santa Maria and Juan Fernandez on the Chilean coast in 1821. But the Cuban pirates were of more pressing importance, and the public heard with relief that the U. S. S. *Macedonian*, Captain Biddle, with a contingent of 200 marines was to sail on a "pirate-hunting" expedition, "to sweep the land as well as the sea of the priates of Cuba." Something was accomplished during the summer; but Biddle was led to believe that the captain-general meant to exclude our cruisers from the Cuban ports of entry—a prohibition which does not appear to have been intended. This squadron sailed in March, 1822, a few days before a committee of Congress had filed a report upon the spread of piracy, "attracting to it the idle, vicious, and desperate of all nations, more particularly those engaged in the slave-trade from which the vigilance of American cruisers has driven them; and that if not winked at by the authorities in the island of Cuba, they are in no respect restrained by their interference." Congress did not act until the next session; but early in 1823 the President was authorized to build or purchase vessels at a cost of $160,000, to be employed for repressing piracy, though one member objected to the purchase of steamers and schooners because they would not be permanently useful in

But the reports from Cuba were too alarming to
ier delays.

nittees were discussing measures of protection the
:t. Lieutenant Lawrence Kearney in the *Enterprise*
'oken up a pirate establishment at Cape San Antonio
five boats to cut out three schooners and one sloop
he pirates and recover three prizes, two American
sh. The brigands all fled without fighting; in fact
took 17 sail within a few months without killing
:. Among the papers captured evidence was found
e seizure of the *Exertion* and *Contitution* of Boston
pirates which included a score of Lafitte's men
ned. These vessels were taken in December, 1821,
f the *Exertion* was marooned on a barren cay. Six
in attempting to seek relief in a boat built out of
'ound on the beach; but the captain was rescued.
:idents of pirate-hunting may be noted the rescue of
adrift "with only a dog on board and blood on her
mbian privateer in the hands of mutineers, and a
he captain and mate of which had been hanged.

ic manners of the pirates appear in the record of the
the American brig *Aurilla* on Sal Cay Bank in May,
ighting a schooner the American sent all her negro
deck "to frighten them off if they were pirates."
ot had made her heave to the *Aurilla's* sails were
her deck cleared, no doubt—by a few rounds of
lers drove all hands below, and the prize was
xt morning an inquiry began as to whether there
on board; the pirates were polite at first, but they
ie deck and prepared for torture. Each man called
leath, as he heard a pistol shot terminating the
f his luckless predecessor. Each had to run the
cabin to windlass under blows from the pistols or
or 20 monsters, all of whom appeared to be Spanish.
n was told to sit down to die, and a shot was fired.
as not completed, however, and the supercargo was
two rounds of torture. The brig *Hiram* of Newport
e bank and was also plundered. The negro women
s cargo were maltreated in public, and the captors
ney knew all the tricks of their trade. Yet they

were not invincible, as the brig *Patriot* of New York showed in September, 1822, by beating off a pirate schooner manned by 40 or 50 ruffians, many of whom fell. The American captain, whose wife was on board, and his second mate were killed in this action.

The year did not close without brisk engagements between our cruisers and the pirates. Lieutenant Stockton in the U. S. Schooner *Alligator* had rescued several prizes in May and June before he had an encounter with a schooner near Sagua. The 70 pirates on board were said to be under the command of Jean Lafitte; but as they kept inside the shoals the rumor could not be verified by her capture. It was reported early in March that the Spanish governor of Matanzas had broken up piratical stations at Point Icacos and Puerto Escondido, bringing in prisoners from both; but later news showed that the plunder of wrecks and prizes was still carried to Point Icacos. Rumor had it that an American brig had been robbed off the point; and the *Alligator* sailed from Matanzas for a search. On November 9 a schooner was sighted with her deck full of men and Stockton lowered his boats to chase in-shore. When some ten miles had been rowed the schooner rounded to, hoisted the red flag—this signal for battle was as often worn by pirates as the black ensign first adopted as an emblem of mourning and revenge after the execution of Charles I—and opened with round and grape. The boats could only return musketry; but a dash was made to board. The pirate was silenced and deserted by her crew, covered by the fire of a consort. Lieutenant Allen sent a midshipman in the gig to take charge of the prize, and pulled for the second schooner, which now had 100 men at quarters. Within two boats lengths the attack was checked: the cutter sheered off, encumbered by the dead and wounded at the oars; Allen in the launch was hit by two balls; and both boats dropped back to the schooner they had taken. The gallant officer died in four hours, regetting nothing except that he could no longer provide for his mother and sister. The prize was well armed with six and twelve-pounders; and two other vessels were recovered the next day. The governor of Matanzas paid honor to Allen and his comrades, of whom four were dead, by sending an escort to the funeral. He had already shown good will by lending arms and granting a warrant to a plundered American vessel to attack the pirates and recover her own. The *Alligator's* boats had killed 14 of the scoundrels, and many had been wounded.

Congress having sanctioned the equipment of a squadron "for purpose of repressing piracy," Commodore Porter was pointed to command it and superintend the purchase of vessels. bought eight schooners of the Baltimore type and also the am galliot *Sea Gull*, perhaps the first steamer to be used as a gship; and these were supported by two or three sloops-of-war by the older schooners already in the service. These were med for marine monsters—a boatswain of forty years ago unded in reminiscences of the schooner *Shark*, "with a flying th-deck, all gratings and hatches"; but the newer lot had nes ranging from *Fox* to *Ferret;* and there was also a flotilla led after insects. All expectations were disappointed when se light-draft vessels were set to work; the hardest tasks fell boats cruising along the reefs; and Porter had to ask for frigates give his men rest and comfort after weeks spent in open boats. ctically, light guns and small arms were the most effective nament for pirates or their antagonists, as the buccaneers had g since demonstrated; and none of Porter's schooners ever sed with an enemy of equal force.

The commodore's instructions must have caused as much conrn as his equipment. Congress had refused authority for the mmanders of our public vessels to "destroy pirates and piratical ssels found at sea or in uninhabited places," holding it incontent with the laws to punish without trial. The Secretary of Navy, Benjamin Thompson, doubtless consulted President onroe before giving Porter his sailing orders: "moderation d forbearance," were duly enjoined before tackling the problem territorial jurisdiction. It could not be assumed that any nation uld countenance piracy; and those sent to suppress it had "a ght to the aid of every other power." As belligerents may rry pursuit into neutral territory, "in the case of pirates, the ght . . . is more complete," since there could be no neutrals in gard to enemies of the human race. As for the retreat of the nditti into uninhabited parts of the islands, the commodore was ld to pursue "only as long as there is reasonable prospect of ing able to apprehend them," turning captives over to the local thorities for trial and punishment, or, if prosecution was not omised, holding them subject to the department's order. In port d in settled districts he could act only to aid the local authorities to seize and bring the offenders to justice," a limitation which

has to be kept in mind in discussing the commodore's subsequent trial by court-martial.

Porter's squadron sailed from the capes of Virginia in February, 1823, and on May 10 he reported from Matanzas that within 43 days from the date of sailing he had examined the north and south coasts of the Greater Antilles, searching coves and cays, and driving the pirates inland, where only Spanish authority could reach them. No captures had been made at sea during this "arduous and fatiguing" cruise; but something had been done for the protection of commerce. The commodore stated his case more emphatically in a letter to the New York *Evening Post* as soon as he had read its number of April 10, which had pointed out that piracy was still "prosecuted with increased and triumphant success every day," and that this compelled doubt as to whether his squadron had been disposed in the most efficient manner. Porter never refused a challenge to take part in a debate in the newspapers; and he replied by relating how he had set about his task of "thoroughly scouring the West Indies"; the *Peacock* had just been brought into the harbor of Matanzas by her captain and sailing-master without the help of other officers, the rest having been left "in the ship's boats in search of pirates among the cays 300 miles to windward." There had been no vessel of the Navy in Cuban waters when he sailed, and his request that the New York papers should keep his movements secret had been made in vain: "It is to the total destitution of protection to our commerce then, and to the information given to the pirates through the press . . . that they were encouraged to make a last effort to obtain all the plunder possible before my arrival." It is hard to conceive that Domingo and Diablito read the *Evening Post*, even when they found it in a prize, and it was soon apparent that piracy was not extirpated in May, 1823. Yet much had been endured and something accomplished before the commodore began to write.

The brig *Pilot* of Norfolk was taken by the notorious Domingo, who had commanded the pirates when Lieutenant Allen was slain, and the prize was sighted early in April, eight days after her capture, by the *Jackall*, commanded by Lieutenant Stribling, U. S. N. After chasing all day between Havana and Matanzas Stribling lowered his boats to take possession, and most of the pirates jumped overboard. Many were killed or drowned, 14 at least, but Domingo and three others swam ashore. The pirate

tain's escape was to be regretted, of course, though Porter dits him with a "singular act of politeness" in forwarding all letters for the squadron which he found when the *Pilot* was en; but his Latin gallantry led him to retain the miniature of officer's wife.

During April also the *Peacock* had gone to the westward as as Cape San Antonio, Captain Cassin conducting a flotilla ough the intricate channels inside the Colorados Reefs. After ing a new 16-oared boat which the pirates had hidden among mangroves near Bahia Honda Cassin trimmed his vessels by head and followed the boats which took soundings to find the nnel. His vessels often grounded, and sometimes had to be e through the mud in six feet of water. Not more than 20 es a day could be covered; but Cassin succeeded where the glish had failed; and his task can hardly be appreciated except those who have cruised inside the Colorados. The voyage was vened by the discovery of a deserted village from which the ates had fled, and their palm-leaf huts were burned to the und. The same passage was made in 1824 by the *Sea Gull* and arge which entered at Cape San Antonio and proceeded east-d to meet another flotilla; but they missed taking Diablito, o had sailed from the cape ten days before their arrival.

This rover had escaped from the active pursuit of Lieutenant tson, U. S. N., in July, 1823, when the boats of the *Mosquito* *Gallinipper*, manned by only 26 seamen, chased a topsail-ooner and a barge into Seguipa Bay. The schooner anchored h a spring on her cable, and her long nine and two six-pounders ned with grape. The boats dashed in with cheers—"Huzza Allen!" and that sort of thing—and the pirates jumped over-rd; some were killed in the water; but Diablito survived to ew his piracies. It is not always clear whether the failure to e prisoners was due to the facilities of the jungle or to the ling that, in the words of the late Admiral Porter, the atrocities nmitted on our merchantmen had "placed the freebooters out the pale of mercy." Lieutenant Newell in command of the *rret* seems to have held similar views when he chased a pirate o a bay east of Matanzas and found that the reef was breaking oss the entrance: "I was then compelled to resort to making ks close in with the reef, giving them long tom with round l grape in hopes to destroy the boats—as to killing any of them,

it was impossible." But their den was broken up by Spanish troops next day.

The south coast of Cuba was no less infested by pirates than the Old Bahama Channel, and Cape Cruz and the Isle of Pines were among their lurking-places. Lieutenant Kearney sent two boats to assail the pirates who had fortified themselves near the cape; and the exhaustion of the senior lieutenant left the expedition under the command of Farragut. The pirates did not stand to the guns they had mounted on a bluff, and their huts were destroyed without loss of life. A woman was seen among the outlaws, but no captures could be effected. Two men so old and decrepit that they were not fit subjects for chastisement were released. Kearney had kept only one officer and men to work the guns in each schooner when he put them aground in six feet of water to support the landing-party. He recommended, in view of his experience at Cape Cruz and Cape San Antonio, that, "the fishermen, as well as the pirates, should be removed from all the capes or other uninhabited parts of Cuba where the proper authorities have no control." Farragut's notes on the affair are somewhat in the Tom Cringle vein, as he had to describe the results of a long tramp through mangrove swamp and chapparal upon the costume of himself and his party.

The Yucatan Channel was by no means a safe trade-route. Pirates were said to inhabit the islands; and Contoy and Isla de Mugeres—which our people called "Mohair Key" in the same temper that transformed Cayo Hueso into Key West—were searched without result. But Lieutenant Gregory of the *Grampus* heard of a pirate establishment at New Malaga near Cape Catoche, where nine prizes had been brought under the shelter of a fort. Spoil was regularly shipped to Havana; and the brigands went out in small boats to intercept merchantmen. The American schooner *Shibboleth* was found at anchor in June, 1823, and boarded by 14 ruffians in a canoe. After killing the anchor-watch the pirates drove the rest of the crew below, spiked down the hatches, and piled logwood upon them. When they finished plundering the ship was set on fire with her head sails hoisted to drive her ashore; but by desperate exertions the crew got on deck and saved their vessel. Among the nine prizes taken in two months was a Guineaman with a hundred slaves and a lot of ivory—for which a market had doubtless been found in Havana.

y could hardly venture inside the reefs to attack this hment, but the pirates soon had to desert Yucatan.

er's first year in the West Indies closed more quietly than begun; and the President's message gave the squadron or having "almost entirely destroyed the unlicensed pirates a" prior to December, 1823, adding, however, that the same was still committed in adjacent waters "under the abusive Spanish commissions," with Porto Rico as a base of opera- The President also referred to foreign efforts for the sup- n of piracy; and the story would be incomplete without otice of the work done by the British naval forces.

Admiralty had issued orders for the maritime police of the ndies in 1818; but these seem to have been forgotten in eign office by 1822, when Canning, alive to the danger that nited States, in order to prevent further depredations, seize Cuba as well as Florida, and thus hold "both shores channel through which our Jamaica trade must pass," sent g to Madrid. He contemplated sanctioning reprisals by the shipping and harbors of the Antilles and the main be made answerable for the injuries done by those com- destroyers they had assisted or sheltered, calling this "a emedy for a local grievance." The Spanish government, and VII then ruling as absolute king, was urged to instruct officers to act "in time to prevent a blow being struck in

after the new West Indian squadron sailed in December, anning learned that the admiral on the station had "already upon himself, from the very necessity of circumstances, to threaten almost as much without orders as his orders will escribe." When a new squadron was sent out in 1823 it aced under the command of Sir Edward Owen with a dore's pennant, the admiral being recalled. Porter thought s done in order that he and the British commander-in-chief meet on equal terms, and though declining any general plan perative cruising, he testified to the cordial support of the officers on the station in the campaign against piracy. ward Owen did not refrain from calling Porter's attention fact that the British forces had better fortune in making s than had fallen to the lot of their rivals and allies, the ans. This was written with reference to the seizure of

the notorious *Zaragozana*, with her crew of cut-throats, by the cruisers *Tyne* and *Thracian* in April, 1823. The British ships were disguised as merchantmen when the pursuit began; but the pirate was not deceived, and he crowded sail for one of the harbors to the westward of Baracoa. With his broadside trained on the entrance and his musketeers in the thickets he opened fire under the Spanish ensign—which he soon replaced by the black flag to give his men the courage of desperation. After 45 minutes the English boarded, and the pirates sprang overboard. Ten of them were killed; 16 fell into the hands of the Spaniards; and 28 were carried to Jamaica, where they soon paid the penalty of their crimes, dying bravely enough, if Michael Scott can be trusted. The *Zaragozana* had been fitted out in Havana in January, 1823, and allowed to sail as a merchantman—with a crew of 50 men.

Another rover called Pepe had lost his schooner *La Gata* in a similar action with H. B. M. S. *Grecian* in March, 1823. The pirate fought at anchor with his eight guns on one side, the red flag at the fore and skull and crossbones on a white ground at main. The *Grecian* lay aground for 50 minutes, plying round and grape until the pirate blew up. A third of her crew of 90 were killed or wounded, but only five were taken, a flotilla being at hand to rescue them, as well as to take part in the fight. The *Icarus* broke up a pirate colony at the Isle of Pines, where Pepe, who was on the best of terms with the Spanish governor, is said to have been killed; and the same captain visited Bahia Honda in August, 1824, killing many pirates and cutting out two of their vessels and a captured American brig. These were substantial achievements which Porter's captains were striving to emulate.

The commodore had established friendly relations with the captain-general of Cuba as well as with the British commander-in-chief. In May, 1822, Biddle had applied at Havana for leave to pursue pirates on shore, and met with an explicit refusal. A year later Porter understood that his ships were to be excluded from all Cuban harbors; but Captain-General Vives disavowed any such ruling and directed the cooperation of all local authorities with the Americans. In 1824 Porter released a vessel captured by Lieutenant Kennon, whose trial by court-martial was the sequel of the inevitable newspaper quarrel, accepting the captain-general's certificate and testifying to his loyal support of the campaign for the suppression of piracy.

e activities of 1823 were arrested in August by an outbreak
low fever at Key West, the new naval station which Porter
ounded under the name of Thompson's Island. During the
eek in September two lieutenants and two midshipmen died.
he commodore and all his surgeons were prostrated. Such
nics were frequent in those days; the *Peacock* had lost as
officers and men in 1822 as were stricken at Key West in
r's time; but the movements of the squadron were hampered;
he department had to inquire whether its new station could
de healthful. A medical board reported that pools of stand-
ater made the air unwholesome and that the "annoyance of
uitoes and sand-flies" deprived overtasked officers and men
necessary amount of rest. The remedy was to send invalids
and to have a floating hospital anchored to windward, where
r would be pure and the sick beyond the reach of annoying
s. Doubtless the recommendation was sound, though the
y was still imperfect.

e commodore reported from Baltimore in November that he
of no pirates afloat or established on shore in the West
s; all had been taken, burnt, destroyed, or driven ashore to
nto the hands of Spanish troops. He had "searched every
and corner" of the Cuban coast; and he had found barges
nost efficient force, though a frigate was needed to supply
s for the flotilla. This report gave color to the President's
age, and the new Secretary of the Navy, Samuel L. Southard,
ded the approbation of the department for the services of the
dron.

rter sailed for the West Indies in February, 1824, and made
ounds of the station, beginning at St. Thomas and Porto
and hearing of pirates on the Cuban coast. Yellow fever
out at Key West on May 28, and the commodore wrote that
eant to send most of his vessels north. He and his letter
ed at Washington on the same day, June 24, and the depart-
ordered several vessels to return to the station without de-
Two of the schooners had been left to convoy shipping be-
Key West and Matanzas; but the press, backed by com-
s from merchants and insurance companies, began to indulge
ticism, all of which the commodore indignantly repelled. He
ed out that his efforts had changed the character of piracy,
n no longer roamed the sea but took spoil in open boats, and
became harder to suppress. The pirates could count on

finding merchantmen becalmed at certain hours of every morning, and could retire to their lurking-holes as soon as they had taken plunder. The islands off Yucatan and the channels inside the Colorados Reefs had been diligently searched in April without finding any pirates.

Nevertheless, the brig *Acasta* of Portland was robbed in that month, and her crew were maltreated before their release. In July, however, it was reported that Domingo and Diablito, having formed a league of pirates in Yucatan, had quarreled with their comrades over the distribution of spoil, and that the latter had been blown to pieces by a blunderbuss, Domingo swimming ashore after his arm had been slashed by a cutlass and returning to Havana. An agent of the state department investigated conditions in Havana, and his reports, which the commodore much resented, gave notice of later piracies. A rendezvous at Sal Cay drew in many of the crews of slavers and other Spanish vessels which the Colombian privateers had captured and sent into Matanzas. The captain of one of the rare Spanish men-of-war on the coast had been seen in communication with a notorious pirate, and his explanation that he had been treating under a flag of truce was not reassuring. In September a launch belonging to Regla took an American vessel; indeed, the captain-general is said to have declined to pursue a search for goods taken from a Boston vessel for fear "all Regla would be found to be implicated in the robbery." The brig *Laura Ann* of New York, laden with jerked beef from Montevideo, was taken and burned in October, only one of the crew escaping. The first hiding-place he found after swimming ashore among the sharks was stored with plundered goods, "which induced him to clear out and proceed from that scene of horror." A month later the *Edward* of New York was taken by four boats off Cape Maysi; and all but four of her crew were murdered. Evidently an American squadron was required in the West Indies when Commodore Porter was ordered on October 14 to return to his station.

The critical reporter at Havana explained the temper of the Spaniards in regard to piracy: the pirates themselves said that they robbed only the enemies of Spain; and others pointed out that Spanish merchants had sustained immense losses from captures made by Colombian or other privateers commanded and partly manned by citizens of the United States; thus the conduct of our

government was no less reprehensible than that charged against the Spanish authorities, even if they chose to connive with pirates —with whom most public officials in Cuba were allied by a "pecuniary interest." The envoy urged the seizure of vessels belonging to towns where pirates were fitted out or received and the levy of contributions as a further penalty. His remark that, "the suppression of piracy and the transportation of specie are incompatible" drew a remonstrance from Porter, who showed that his ships had transported less than $400,000 and had gained but a trifle by that current practice. On the whole, the commodore proved that his forces had been judiciously disposed and actively employed up to the date of his return to the West Indies in October, 1824, though neither the President nor the Secretary concealed their disapprobation of his withdrawal in June.

The commander of the *Porpoise* reported that his boats had searched the coast to the eastward of Matanzas, and on October 22 had taken a pirate schooner and an American cutter, finding evidence on board these vessels that several prizes had been robbed, not without murderous incidents. Three pirates were taken and delivered to the authorities at Matanzas for trial. The next notable exploit of our West Indian squadron, which numbered 13 vessels until the *Ferret* was capsized in a squall, was the capture of a pirate schooner in the same region by the boats of the *Sea Gull* supported by those of H. B. M. S. *Dartmouth*. The rover anchored close to the mangroves and fought ten minutes before his crew began to swim ashore. Five of them were killed, and 19 captured. This vessel pretended to be a Spanish privateer, but it was believed that she had lately robbed the brig *Betsey* of Wiscasset and murdered her crew. Another ghastly tale was related of 13 bodies found tied to trees near the point where this pirate was captured. The British forces made another capture in this spring of 1825, judiciously hiring a small steamer to assist their boats.

Diplomatic relations with Spain and the financial affairs of several officers of the squadron were complicated by the seizure of certain vessels which the federal courts would not condemn for piracy. Thus the *Spark* had taken the *Ninfa Catalana* off Havana in October, 1822, because an American captain had reported that some such Spaniard had plundered his vessel; but the judges at Norfolk released the prize and awarded damages against Lieutenant Wilkinson, U. S. N., which amounted to $12,000 before

Congress provided for his relief in 1827. The *Carmen*, taken by the *Peacock*, was also cleared, and Captain Cassin was accused of malicious contrivance by the Spanish minister because he sent the crew to Pensacola and the vessel to New Orleans. The courts at Charleston were not apt to show favor to our naval officers, as appeared by the famous decision in the case of the *Panchita* in 1822; and even condemnation did not ensure a reward for the captors. Thus Lieutenant Kearney petitioned Congress in regard to the condemnation of three piratical craft and two other vessels recovered from the pirates. These had been taken in 1821 by the *Enterprise*, but the costs had amounted to more than the pirates' vessels sold for, and most of the salvage allowed had gone the same way. Kearney asked that part of the $9000 paid in duties on the cargoes he had brought in might be allotted to the officers and men of his ship for "the risk and trouble they have had in the capture aforesaid"; but it does not appear that any general measure of relief was carried out for the benefit of the survivors or the families of those cut off by hardships or epidemics.

THE HARBORS OF PORTO RICO

This island was the storm-centre of Porter's campaign against piracy for special reasons which deserve consideration. In the first place, it was notorious for the privateers which sailed to harry the commerce of neutrals with Mexico and the Main to bring spoil to San Juan or Ponce. Both British and American protests abound in denouncing the conduct of these loosely commissioned rovers—their letters of marque under the royal seal and signature were sent out from Spain in blank and the names and dates were inserted at the discretion of some naval officer, usually one acting as captain of the port; they took vessels engaged in lawful trade within or without the limits of the 1200 miles of coast over which three vessels of the Spanish navy, a frigate, a brig, and a schooner, pretended to maintain a blockade; the right of search which they claimed often led to thefts from vessels which they dared not seize; and their inhuman dealings with captives of all sorts were notorious. They could not keep the seas clear of the privateers which used the flag of Colombia or Buenos Ayres or hold filibustering in check, but they were notorious disturbers of traffic.

Of the dozen privateers which hailed from Porto Rico in 1822, the *Panchita* or *Palmyra*—names could be shifted to suit the

rs in hand—was destined to become the most notorious. In ıst, 1822, Lieutenant Gregory, U. S. N., had his facile indig-n aroused by the statement of an American captain whose had been robbed by a boarding-party from a vessel like the *hita;* and the young captain of the *Grampus*—who was to ve the war which ended in 1865—resolved to call her to ınt when the ships met at sea. His opportunity came on ıst 15, and the *Panchita* was overhauled and summoned to nder, a demand which the Spaniard affected not to under-l, though the *Grampus* lay within pistol-shot under her lee; ile repeating the demand he poured into us a full volley from nall arms and cannon, which was instantly returned and con-d three minutes and a half, when he struck his colors, a com- wreck, having one man killed and six wounded." The water up to the cabin floor when an American officer took charge ' laid her over on her side by shifting the guns" to stop the . Gregory landed the wounded in Porto Rico and carried rize with 77 of her crew to Charleston.

ıe Spanish account relates that the *Panchita* had the Spanish n aft and a white flag at the fore—which was not denied—that she stood for the *Grampus* to deliver an official letter Gregory fired and "assassinated" one of her crew. The ish minister accordingly applied for redress: "The Spanish ıas been insulted and attacked; Spanish citizens killed and ded; Spanish property plundered and carried away on the seas." He added that the captor had kept his prisoners in and otherwise ill-treated them on the voyage and at St. ıas, where he had "celebrated his victory with feasting and ing."

ɛgory thought he had treated a company of pirates as well ɛy deserved; a third of them, he said, belonged to "the Sugar gang" and had resorted to Porto Rico "for the purpose of ing their villany with Spanish commissions." Some were to turn informers, and much crime might be disclosed. But vidence failed to satisfy the federal court at Charleston, ɛ Drayton ruling on October 8 that the *Panchita's* commis-was "a regular one of a private armed vessel, and that the of such part of the crew as have committed depredations on ommerce subject them only to punishment, and do not create feiture of the vessel." Gregory wrote to the *Charleston*

Gazette, "If I know anything, I hope I know the duties of my profession"—which seemed in that day to include writing for the journals; and he restated the evidence to show that he had not brought in a prize without strong grounds for her condemnation: two of the crew were recognized as belonging to the Cape San Antonio band of pirates; the *Panchita* or *Palmyra*, whose commission did not fit her tonnage, had boarded vessels while flying the French or Venezuelan flag instead of her proper colors; and her papers had been illegally extended. He disclaimed any intention of criticizing the court, though he had to appeal against an award of damages; but his opinion that there had been a miscarriage of justice seems to have been shared by Adams, the next President, who was then Secretary of State, and financial relief was doubtless granted.

Lieutenant Gregory had hoped that his action would not cause a coolness between the United States and Spain; but the Americans and English in Porto Rico were in need of protection when the wounded were brought in; and the story of the *Panchita* embittered the relations of our naval officers with the people and government of the island for years. Excitement was renewed when the schooner got home after her release; and Porter found that the affair had not been forgotten when he arrived on the station. He had fortunately been preceded by the *Cyane*, in August, 1822. Captain Spence sent a daily letter to the governor during a week in port, demanding and securing the release of one American crew and commenting severely upon the whole course of privateering in Porto Rico and the paper blockade. As for the *Panchita*, her conduct had been piratical; moreover, "What armed vessel could expect to fire on an American man-of-war with impunity?" The governor did his best to baffle the flow of discursive criticism by pleading ignorance or lack of authority; but Spence got what he had most urgently demanded. The gallant captain wrote in forwarding his correspondence to the department with obvious complacency that, "It cannot, however, be expected that an officer who embarked at the age of eleven on an element where the accomplishments of a scholar are not required, should shine in a correspondence of a diplomatic cast." Whether he found it inconvenient or not to be without an interpreter capable of rendering the Spanish letters or not, Spence must have been proud of his ultimatum; the captain announced that, to prevent "maritime

archy," he meant to give convoy and "treat as an enemy . . . y privateer . . . that shall cause hindrance to the lawful yage of an American vessel." Little more was heard of the ivateers of Porto Rico after this; but the era of good feeling as to be long postponed.

Pirates were forming colonies on the islands around Porto Rico, d the capital had lately been alarmed by a filibustering expedion which had sailed from New York to revolutionize the colony hen Porter's squadron appeared on the north coast in March, 23, and the commodore sent a communication to the governor. the despatch-boat failed to return on March 4 the U. S. hooner *Fox* was sent in to demand a reply. As she stood in San Juan harbor warning guns were fired from the fort; the st shots were wide, but the vessel was struck at the fourth fire; d Lieutenant Cocke, her commanding officer was killed. Porter nessed this outrage, and he disdained the forms of diplomacy remonstrating with the governor: "Your excellency must be are that it is always in my power to retaliate." Regrets were pressed promptly enough; the governor had been absent; subinates were on the watch for another filibustering expedition; shots were fired as a warning only; and the fatal fourth had n aimed high, hitting because of bad pointing or the heave of sea. Lieutenant Cocke was to blame for crowding sail after first warning; and the officer who had preceded him had been ss in reporting. All these excuses the commodore denounced Iarch 11 as unworthy subterfuges; "Your officers may have ght this a fair opportunity to retaliate" for the affair of the *hita*, which the governor had indiscreetly mentioned: "I have ied your military officers that their force is despicable com- with that at my disposal, and I have convinced the inhabi- that, though they are at my mercy, they will not be made rable for the offenses of an individual."

ter's original communication had been less truculent: he cooperation in the suppression of piracy; and, in view of mplaints made against the Spanish privateers, he desired a tive list of those sailing from Porto Rico, with a set of forms for verifying their papers. How far they had been ted to interfere with our trade to Mexico and other re- provinces was also a matter of concern. The documents d were furnished, with the information that all commis-

sions were sent out in blank and completed by naval officers on the station; and the commodore was informed that the Venezuelan blockade had been raised, except for contraband, while the Mexican situation was uncertain. If the governor's stipulations were observed there could be little further danger from Porto Rican privateers, and no specific charges seem to have been filed against them in 1823, though the President denounced their methods in his annual message.

The decline of privateering, like the check which the slave-trade and more legitimate branches of commerce had suffered, tended to furnish recruits for the revival of unlicensed piracy; and the temper of the maritime population and the officials of the island may have accepted that pursuit as the only way to get even with the Americans. Both ends of Porto Rico border straits opening into the Caribbean; and the islands of Mona in the west and Vieques (Crab Island) in the east are convenient strategic outposts for preying upon commerce, as the buccaneers had long since demonstrated. Vieques might also serve to check the depredations of the notorious filibustering privateers who haunted St. Thomas while cruising for the new republics of Spanish America. Porter heard in January, 1824, that there might be found on the island of Mona "an establishment formed by the piratical population of Porto Rico" and said to be well-armed. He therefore directed Lieutenant Newton, who was about to sail in the *Spark* to search the southern coasts of Porto Rico and Santo Domingo, to seize the place and destroy all the boats which the pirates had collected, "thus cutting off their retreat"; but it does not appear that the expedition had any success. A more fortunate enterprise was planned in March, 1825, for extirpating certain outlaws established at Vieques. Considering all that had happened in Porter's cruise in these waters, it is surprising to find Spanish officials in Porto Rico capable of cooperating with the American Navy. Yet they consented to aid Lieutenant Sloat of the *Grampus* in pursuing a native of the island who had won fame as a pirate; and the men of the *Grampus* embarked at Ponce in a vessel owned and commanded by a Spaniard, the allied forces sailing for Crab Island on March 2. The chief pirate was Roberto Cofusi, a Porto Rican sailor of 26 years, who had lost his first vessel at Mona in 1824, and had been sentenced for six years for his crimes. Escaping from prison without delay, he resumed his

and he was credited with seven or eight prizes before his came to an end. He denied, however, that he had ever ered his captives. He had only 14 men and a small sloop at es, and he was constrained to hide his vessel among the man- s in the narrow harbor called Boca de Infierno. The Spanish found her way in with some hazard, and one pirate was and three taken with their vessel. The rest escaped for a but Cofusi was taken by Spanish soldiers that night; and his des within a few days. They were carried to San Juan and y court-martial on March 27, and two days later they were ed. Though they alleged that the crews of their eight had been spared, rumor had it that they had murdered 400

months before this episode was over Commodore Porter mmitted the act that resulted in his exit from the service h he had won so much honor; "the extraordinary trans- at Foxardo," as Secretary Southard called them—Fajardo Spanish name, but the navy never learned that spelling— e culmination of two years of controversy and irritation. ober, 1824, Lieutenant Platt of the *Beagle* was told that e-house of an American merchant acting as consul at St. s had been robbed of goods to the value of $5000, and was suspected that the spoil had been carried to Foxardo very to a local trader in stolen property. No proof con- this conjecture was ever secured; but Platt thought it his cross to Porto Rico and make search for the goods with of one of the consul's clerks. He committed the tactical of going ashore in plain clothes, but he presented himself lcalde of Foxardo as an American officer and thought that obtained a promise of cooperation. A few hours later lde, apparently intimidated by the townsmen, ordered rrest; and he and two companions were not released until mission and his orders to command the *Beagle* were pro- As Porter declared after the affair had been reported to officer in search of freebooters had been arrested and in- and he felt bound to exact an apology—though not to te the search.

ovember 12, 1824, the *John Adams*, *Grampus* and *Beagle* d off the mouth of the Rio Fajardo, and marines were o spike the guns of the shore battery. The commodore then

marched inland to summon the town. The alcalde was invited to come out with the captain of the port to give satisfaction for the shameful affair: otherwise the competent force then present—the commodore had a strong battalion while the Spaniards could only array "an irregular assemblage of armed men"—would proceed to punish the aggressors and, should resistance be offered, to destroy the town. The alcalde obeyed, of course, realizing that he had to deal with a man who was *pundonoroso;* and the commodore withdrew his forces after a full apology had been made to Lieutenant Platt in his presence. He said afterward that had he been called to account for failing to seize or destroy Foxardo and its *marina* "as pernicious nests of pirates" he should have regarded himself in more danger than when confronted with the charge of committing acts of hostility against the subjects of the king of Spain. At any rate, his men were kept in hand; and they are not charged with plundering or drunkenness. The Spanish story of their "precipitous retreat" need not be taken seriously.

As soon as his report reached the department Porter was ordered on December 27 to turn over the command and proceed to Washington. The court of inquiry was followed by a court-martial in due course; and Porter, though Barron whom he had helped to try in 1807 was president of the court, and the eccentric Elliot, the foe of every ally of Perry and Decatur, was among the members, objected only to the judge-advocate. The first charge coupled disobedience of orders with unbecoming conduct rather awkwardly, but the specification was impregnable when compared with Porter's instructions; the charge of insubordination related to the commodore's habitual use of the press in all controversies. With the sentence of six months' suspension was coupled a tribute to his zeal for the service; but he promptly resigned his commission because he "could not associate with those who were led away by men in power to inflict an unrighteous sentence"; and he liked to believe that the affair had injured the Adams administration. General Jackson, whose example in pursuing "land pirates" in Florida had been invoked in the defense, offered to restore Porter to the navy, but finally made him minister to Turkey.

Porter was convicted on August 10, 1825; and the Secretary of the Navy congratulated his successor, Commodore Warrington, a month later on "the subdued state of piracy within the sphere of

" Relations with Spanish authorities had mani-
before Porter was relieved: thus in January he
compliments with Captain-General Vives and re-
cate that he had "respected the territorial rights"
ghout his cruise; and, though the Spanish minister
d his conduct in May, 1825, he offered no testimony
or the Foxardo incident. In fact, he had said that
t's action in relieving the commodore and ordering
ial would doubtless satisfy his Catholic majesty of
en it was rumored that Porter was resolved to create
avy offers were made with reference to the reward of
ch he had earned at New Orleans in 1807; but the
was not to be tempted.

he governor of Porto Rico directed all his subordinates
rican cruisers in suppressing piracy; and one instance
cooperation has been cited. A committee of Congress
January upon the evils of piracy and lawless priva-
oposals for reprisal and the blockade of Cuban ports
ed; and it was held that merchantmen might arm to de-
selves, but that the law which required bonds to prevent
er use of arms—the Secretary of the Navy had declared
iction to be indispensable—should be maintained.
pain had made no offer of reparation she had promised
new minister to Washington. The cessation of hostilities
Spain and her colonies brought partial relief before 1830;
y without political pretense was not infrequent during
d. Thus one crew of Spaniards was brought to justice
tar in 1829, after their spoil had found a market in Spain;
her was hanged in Boston in 1835, for robbing an Ameri-
, having been arrested by a British cruiser.

r became commander-in-chief of the Mexican Navy in
d again found employment in the West Indies, making
est his headquarters until an American squadron induced
withdraw. From Vera Cruz he had issued an invitation
irs of all nations to cruise against the ships and goods of
ds. Spanish cargoes might be taken from neutral ships,
prizes were to be brought to Vera Cruz if possible, though
allowed his cruisers to sink or burn captured vessels and
spoil on shore in Cuba. The report of the Secretary of
y for 1827 did not name the commodore, but, after stating

that there had been no recent piracies in the West Indies, added that the "only unpleasant occurrences afloat" were due to his occupation of Key West and his indiscreet invitation to privateers. In both cases, our cruisers were ordered to protect our commerce and neutrality; but there proved to be no necessity for the employment of force. The harbor was evacuated as soon as the Spanish men-of-war, which had begun to cruise effectively at last, were out of the way; and a treaty with Mexico put an end to irregular privateering.

The officers and men who pursued the West Indian pirates had few opportunities to gain honor or reward in naval engagements, but their experience in navigating unsurveyed coasts and channels must have advanced their professional capacity. No prize-money could have balanced the risk of health involved by climatic exposure, but the release of so many prizes by the courts was a sharp disappointment to many. The mortality from yellow fever was a painful blow to the service; Lieutenant Watson only lived a few months after his defeat of Diablito; and many officers who, like Farragut, Kearney, and Gregory, might have survived to take part in or witness the Civil War, sacrificed their lives on the coast of Cuba or at Key West. Sanitary science had done little for the sojourner in the tropics in that age; and an epidemic might be regarded as an inevitable feature of any protracted cruise in the Caribbean or the Gulf of Mexico.

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SONNEL LEGISLATION.

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hat there are as many ideas in the navy relative
e requires in personnel legislation as there are
n the service. The personnel act of 1899 reme-
is condition of affairs by bringing more rapid
y amalgamating the line and engineer officers.
d the conditions as they existed in 1898, but all
t another hump is forming. To create a system
are of this hump and permit a healthy flow of
out doing injustice to the individual is indeed a
o solve. In attempting to do justice to the indi-
and costly retired list is liable to result and the
of such a list is sufficient to kill any remedial

n, therefore, is to maintain a healthy flow of pro-
st to each individual concerned and keep the cost of
t down. The question certainly is difficult of solution
g it every officer is prone not to think so much of
st for the service?" as "How does it affect me?"
he total displacement as given in the present bill before
considered. This displacement of 1,200,000 tons used
ould result in the following:

ber of enlisted personnel....................	60,000
ber of line officers..........................	3,000

) line officers would be distributed as follows, accord-
ill:

- 30 Flag officers { 1 Admiral. / 5 Vice-admirals. / 24 Rear-admirals.
- 120 Captains.
- 150 Commanders.
- 390 Lieutenant-commanders.
- 900 Lieutenants.
- 1410 { Lieutenants (j. g.). / Ensigns. / Midshipmen (all at Academy).

3000

This number in each grade would result if 3000 line officers and midshipmen were in the service. Such is not the case, however.

An examination of the register of the navy shows that the number of line officers, exclusive of extra numbers, amounts to about 2350, of which approximately 700 are midshipmen at the Naval Academy. If this number, 2350, were distributed in the proportion given above there would result:

23	Flag officers	1 Admiral 4 Vice-admirals. 18 Rear-admirals.
94	Captains.	
118	Commanders.	
305	Lieutenant-commanders.	
705	Lieutenants.	
1105	Lieutenants (j. g.). Ensigns. Midshipmen (all at Academy).	

As ensigns cannot be promoted until after seven years' service, there would be only 650 lieutenants instead of 705 and there would be no lieutenants (j. g.). This would make the list top heavy and this condition is taken care of in Section 11, which provides:

> That until the full authorized strength of the grades above ensign and below admiral of the navy shall have been once attained, the actual strength of said grades on July 1 of any year shall be distributed in the proportions as required by section four of this act, down to and including lieutenants, together with a proportionate number of 12 lieutenants (junior grade), a fractional surplus in any higher grade to be neglected in that grade and carried to the grade below: Provided, that the authorized strength of any of said grades at the date of passage of this act shall not be hereby reduced. The promotions of officers for total length of service, as required by section ten preceding, shall begin on July 1 following the passage of this act, and shall continue on the first day of each fiscal year thereafter. The numbers in the several grades determined by the requirements of this act for any year shall obtain throughout the fiscal year, and vacancies occurring during the year shall, subject to the provisions of section ten preceding regarding the promotion of ensigns, be filled in order of seniority from the grade below.

It therefore becomes necessary to consider the actual number of officers on the list from rear-admiral down to and including those officers who have completed seven years service. This amounted to 1186 officers on July 1, 1911. The proportion to be used in considering this number of 1186 would be: 1 flag officer,

ıptains, 5 commanders, 13 lieutenant-commanders, 30 lieunts and 12 lieutenants (j. g.).

his would result in the following:

		Senior in Grade.
ᵓlag officers	1 Admiral. 3 Vice-Admirals. 18 Rear-admirals.*	
ᵓaptains		C. J. Boush.
ᵓommanders *		G. W. Kline.
.ieutenant-Commanders		Y. Stirling, Jr.
.ieutenants		B. A. Long.
.ieutenants (j. g.)		W. T. Mallison.

* Present number cannot be reduced.

ı addition to the above, there would be about 460 ensigns. re would be no midshipmen at sea.

o fill all the vacancies in the line by this bill, if the enlisted onnel were to be increased to 60,000, would require 500 more shipmen to be appointed this next year to the Naval Academy would ordinarily be the case. This is taken care of in Section 'hich provides that no entering class shall be more than 10 entum of the authorized strength of the line. Therefore, with uthorized strength of the line as 3000, no entering class can be ter than 300. This would spread the increase over a term of s and prevent abnormally large classes.

ıe provisions of retirement incorporated in this bill will not nforced for at least fourteen years, and in a few years after enforced, large numbers of retirements will result. Some ision must be made to keep the retired list actively engaged s to be of active use to the government, and further on in this r is suggested a method of actively employing the retired list out interfering with shore duty assignments for the active list. compulsory retirement to give vacancies should take place re promotion and not after, as it is manifest that any officer .nced may be retired immediately, and it is evident that in time ɾar such officer would not be fit to execute the duties of his .nced rank were he called into service. This would result :tirements of lieutenants and a clause to this effect is required, :heir retired pay should not be below $1000 per annum. A rel officer serving on active duty should of course receive the and allowances of his grade.

By this bill, an officer, unless sooner promoted to fill vacancies, must be promoted:

To Lieutenant (j. g.)	after	7	years	service
To Lieutenant	"	10	"	"
To Lieut.-commander	"	18	"	"
To Commander	"	24	"	"
To Captain	"	37	"	"

Taking eighteen years as the average entrance age of those line officers at present in the service, the average ages of promotion would be:

To Lieutenant (j. g.)	25	years	of	age
To Lieutenant	28	"	"	"
To Lieut.-commander	36	"	"	"
To Commander	42	"	"	"
To Captain	47	"	"	"
To Rear-admiral	55	"	"	"

Any officer of the grade of rear-admiral selected for retirement should be retired with pay and rank of captain, unless he has served as rear-admiral as described later on in this paper.

It cheapens the grade of rear-admiral to have officers retired in this grade who have not performed the actual duties required of that grade and who have never commanded a fleet, squadron, division or even any kind of craft afloat.

A study of conditions as they existed in 1898, 1899, 1900, 1905 and 1910, may be of interest. Below are tables showing the conditions of each grade in the line in the years named above. In 1898 and 1899 the engineer officers are counted with the line relative to numbers, but line officers only are considered in computing ages, etc.

FLAG OFFICERS, LINE.

In 1898 and 1899, rear-admirals and commodores are considered in one group in first table and in separate groups in next two tables:

January 1	1898	1899	1900	1905	1910
Number	16	17	18	26	28
Average flag service.........	4.6 yrs.	4.9 yrs.	5.0 yrs.	3.2 yrs.	2.3 yrs.

REAR-ADMIRALS.

	No.	Average service as Rear-Admiral. Years	Average service as Commodore. Years	Average total Flag service. Years
1898	6	2.1	2.2	4.2
1899	7	2.6	1.8	4.4

COMMODORES.

1898	10	...	...	5.0
1899	10	...	...	5.4

CAPTAINS.

an. 1st ' year.	No. in line.	No. in eng. corps.	Total.	Age of oldest.	Age of youngest.	Average age.	No. of years to pass through grade.
1898	45	11	56	58.9	51.4	55.2	10.5
1899	45	11	56	59.9	52.4	56.2	7.8
1900	70	..	70	60.9	53.3	57.1	7.8
1905	86-a	..	86	60.6	54.1	57.3	5.8
1910	81-a	..	81	61.2	51.5	56.3	3.6
ly 1, 1911				60.9	47.7	54.3	4.0

a. 70 allowed by law.

COMMANDERS.

1898	85	15	100	61.7	49.5	55.6	13.0
1899	85	15	100	60.4	50.5	55.4	12.5
1900	112	..	112	61.3	49.1	55.2	6.6
1905	122-b	..	122	57.7	48.1	52.9	5.1
1910	119-b	..	119	54.8	40.5	47.7	4.0
y 1, 1911				50.3	39.5	44.9	3.0

b. 112 allowed by law.

LIEUTENANT-COMMANDERS.

1898	74	8	82	52.4	47.7	49.7	6.5
1899	74	1	75	52.3	48.1	50.2	5.7
1900	170	..	170	53.3	42.0	47.6	2.9
1905	199-c	..	199	50.9	38.0	44.4	5.8
1910	211-d	..	211	43.5	31.6	37.6	4.5
ly 1, 1911				41.0	31.3	36.2	5.1

c. 191 allowed by law.
d. 200 allowed by law.

LIEUTENANTS.

Jan. 1st of year.	No. in line.	No. in eng. corps.	Total.	Age of oldest.	Age of youngest.	Average age.	No. of years to pass through grade.
1898	250	72	322	50.5	34.6	42.6	21.5
1899	250	69	319	50.6	34.9	42.7	19.0
1900	300	..	300	44.7	28.0	36.4	0.9
1905	343-e	..	343	41.0	24.9	33.0	5.8
1910	319-f	..	319	35.6	24.2-g	29.9	6.0
July 1, 1911				35.1	24.2-g	29.7	6.0

e. 336 allowed by law.
f. 350 allowed by law.
g. Approximate age, no data at hand.

A re-arrangement of above tables will show the following points:

No. of years to pass through grade of	Year. 1898	1899	1900	1905	1910	July 1. 1911
Captain	10.5	7.8	7.8	5.8	3.6	4.0
Commander	13.0	12.5	6.6	5.1	4.0	3.0
Lieut.-commander	6.5	5.7	2.9	5.8	4.5	5.1
Lieutenant	21.5	19.0	0.9	5.8	6.0	6.0

Average age in grade of	Year. 1898	1899	1900	1905	1910	July 1. 1911
Captain	55.2	56.2	57.1	57.3	56.3	54.3
Commander	55.6	55.4	55.2	52.9	47.7	44.9
Lieut.-commander	49.7	50.2	47.6	44.4	37.6	36.2
Lieutenant	42.6	42.7	36.4	33.0	29.9	29.7

Number of line officers (line officers and engineer officers included together for 1898 and 1899):

No. of officers.	1898	1899	1900	1905	1910
Allowed	921	911	1,020	...	....
Actual	893	872	881	959	1,152

The enlisted personnel allowed by law on January 1 of year indicated was as follows:

1898	1899	1900	1905	1910
11,750	13,750	20,000	34,000	47,500

Number of line officers per 100 men of enlisted personnel (only actual number of line officers considered and including engineer officers with line officers in 1898 and 1899):

1898	1899	1900	1905	1910
7.6	6.3	4.4	2.8	2.4

ıdy of the above tables shows that officers of flag rank held ınk twice as long in 1898 and 1899 as in 1910, that is, the e age of flag officers has materially increased since 1898. erage age of captains increased to 57.3 years in 1905, but has ;ed to 54.3 years on July 1, 1911. The average age of com-rs has decreased from 55.6 years in 1898 to 44.9 years on 1911. The average age of lieutenant-commanders has de-l from 50.2 years in 1899 to 36.2 years July 1, 1911, a de-hange. The average age of lieutenants has materially de-l, decreasing from 42.7 years in 1899 to 29.7 years July 1, Therefore, the result of the Personnel Act of 1899 has been erially decrease the ages in grades below captain, but in the ade the average has increased.

length of service in each grade has decreased, giving a flow of promotion, but this healthy flow cannot continue ıpid increase of officers. Also, under the present conditions, ıpossible to have rear-admirals with a sufficient length of in that grade.

January 1, 1912, there will be approximately 140 lieutenants . On January 1, 1913, this number will be increased to imately 205, and on January 1, 1914, to 390, and in 1915 ıt 500. On January 1, 1919, there will be about 950 lieu-s (j. g.).

apparent that the navy is going back to the deplorable on existing in 1898, with lieutenants 50 years old.

re is a general apathy throughout the service to the condi-onfronting the commissioned personnel. Those who are the rank of lieutenant, junior grade, do not fear marking nd this creates a general desire that things take their course. bad, as the best way to cure the service of the evils of a s to avoid a hump from forming.

present bill before Congress does this, but meets with con-le opposition in the service and in Congress. Some of the tion in the service is due to the fact that those maintaining position are just naturally "agin the government," but most opposition is real and earnest. Very few in the service are pathy with the clause in the Personnel Act of 1899 allow-officer retired by the plucking board to retire with advanced This principle was fair in 1899, when officers of the lieu-grade and above were so old, but this condition in the grades no longer holds good. Its absurdity under present

conditions was shown at the last plucking when an officer only 40.8 years old, in excellent health, was retired with the rank of captain, thereby receiving $3750 per annum the rest of his life, after only 25 years service. The greatest service opposition to the bill now before Congress is due to the fact that there is no really just way in which an officer may be selected out. The personal element may be so strong as to cause an officer to be selected out unjustly on one-third pay. If the service could be sure that only the least efficient would be plucked, the strongest part of service opposition probably would disappear.

The opposition in the service to the present bill, therefore, embraces the conditions:

(a) No system of plucking in existence that has the confidence of the service relative to being just and fair to all concerned.

(b) Plucking an officer after 18 years service with small pay.

The opposition in Congress arises from three sources as follows:

(c) A feeling that able-bodied men capable of doing work will be paid by the government for doing nothing.

(d) The cost of the retired list will increase, although it will decrease per capita.

(e) The opposition of the service to the bill bringing influence to bear.

There are, therefore, five conditions to be met before the opposition of the service and of Congress can be eliminated.

Before going any further, attention should be invited to the remarks on Navy Personnel Reform, recently compiled by the Department, from which the following paragraph is quoted:

> Objection is sometimes made to the retirement of able-bodied officers. This in itself might be considered objectionable, but if there is no increase of total cost, and if there is great gain of efficiency, should the objection be regarded as valid? Moreover all such officers form a reserve in time of war. Some countries go to considerable expense to create such a reserve. With us this reserve would cost nothing. Here is a very strong argument in favor of the method, apart from the very material advantages that are the chief object.

The reserve described above is a latent reserve and would cost a great deal when retired pay is considered. Why not have an active reserve? Our naval militia is hard pressed for proper training and our training stations for apprentice seamen have to

ad on warrant officers and chief petty officers in drilling the
The reserve mentioned above could be utilized with great ntage to the service by being actively engaged in the duties structing and training the naval militia and in training the entice seamen. The resultant expansion of the naval militia ably would keep all the reserve actively engaged.

come back to the causes of the two objections by the service the three by Congress, the five causes must be met to produce sion and, therefore, each of the five objections, with a sug-on for removing same, will be considered below.

rvice objection due to condition "a," that is, a fair and just m of plucking. This condition requires a decided change, no legislation is needed for it. The reform can be made by the rtment without act of Congress.

ficiency reports, although better graded now than in the past, only an approximate idea of the worth of an officer. In g responsible assignments, the Department wants to know the ive efficiency of each of the officers so as to pick the one best d for an important post.

t present, in selecting an officer for an assignment, the officers uty at the Department may be consulted so as to make as good ection as possible, but in this case an officer not known to these ers at the Department would be overlooked. Not only will the w-described system keep the Secretary of the Navy informed the service estimate of a man, and therefore the most correct nate, but it will also prove invaluable in selecting out, reflect-as it does the opinion of the whole service, which opinion will ust about correct. The system will also eliminate personal ence, politics and any personal ill feeling relative to an officer lecting out and will give the examining board a fair and square of an officer's value to the service.

his system is illustrated as follows: By March 15 of each the "Register of the Commissioned and Warrant Officers of United States Navy and Marine Corps" of the preceding ary 1 will be carefully studied by each rear-admiral and cap-on the active list. As a result of this system reports will be e by each rear-admiral and captain as follows: Each rear-iral on the active list will report on the captains and com-ders. Each captain will report on commanders.

In making these reports, the officers must each make out his own report without assistance from others and must certify on submitting the report that it is made out in accordance with his belief and that he has consulted no one to assist him in making out the report, swearing to this by signing an oath, which oath is part of the form of the report and must be signed to make the report valid.

Below is illustrated how the rear-admirals report on the captains.

The below list (for example) shows the active list of captains as appearing in the register for January, 19—. Only ten fictitious names appear, as such number is sufficient to explain the idea.

Captains.	Secret number assigned by Department (assigned board after reports are received).
1 John Horace Adams	7
2 Henry Louis Smith	8
3 Benjamin Arthur O'Connor	9
4 Albert Herbert Ford	10
5 Richard Henry Jones	1
6 Thomas Ralph Butler	2
7 Joseph Charles Foster	3
8 Clarence James Fisher	4
9 Robert Edward Reyburn	5
10 George William Martin	6

A rear-admiral, looking over this list and studying it, will submit, for example, his estimate of the ten captains by arranging their names in the order of value as follows:

1 G. W. Martin.
2 B. A. O'Connor.
3 H. L. Smith.
4 C. J. Fisher.
5 J. C. Foster.
6 R. E. Reyburn.
7 R. H. Jones.
8 J. H. Adams.

As the rear-admiral concerned has no personal knowledge of the abilities of Captains A. H. Ford and T. R. Butler, he does not name them in his report. As all rear-admirals report on the captains, Captains A. H. Ford and T. R. Butler are bound to be reported on, however.

A board of officers, sworn to secrecy, meeting at the Department, then assembles the reports, using only the number assigned by the Department and using no names. The numbers assigned by the Department are really assigned by this board of three officers and the number assigned to each officer is kept secret. Suppose, then, the result of averaging the report gives the following table, using the secret numbers as stated above.

Secret No.	Average standing.
8	1.68
6	1.90
2	2.30
9	2.85
3	3.20
10	3.60
4	4.70
1	5.80
7	6.40
5	7.50

The final relative standing of the captains would, therefore, be:

Secret No.	Standing.
8	1
6	2
2	3
9	4
3	5
10	6
4	7
1	8
7	9
5	10

In case it were required to select out three captains, the Selecting-Out Board would naturally select out the captains assigned secret numbers 5, 7 and 1. If, however, secret numbers 4 and 1 are a tie, the board would have before it all remarks that appear on the records of 4 and 1 and would have to use its discretion in selecting out either 1 or 4.

In selecting out lieutenant-commanders and lieutenants a different system will have to be employed, but the secret number idea would still be employed.

lo away with personal likes and dislikes of the board and will iate favoritism, an essential requirement.

ticism may be made that a superior may report on a junior cordance with his knowledge of the junior years past. This be true and for this reason no captain or commander should ported on unless the reporting officer has had official rela- with such in the ten years previous, or else has a thorough ledge of the abilities of such officer from mutual associations last ten years.

is system should be applied to the staff corps, the directors reported on by the chief of bureau and assistant chief of u of their corps plus the senior directors numbering 20% of grade, the 20% making the report on the remaining 80%. The ctors will be reported on by the directors and passed assist- by the directors and inspectors. This, however, can be better ged by each corps developing its own system, as the duties ich that frequently no senior is able to report on a junior.

the Marine Corps, however, such a system is applicable ex- n the case of colonels. It is, therefore, better that the Marine devise a system that will enable reports on colonels to be

s system will probably eradicate opposition (a) of the ser- but opposition (b) will have to be settled by act of Congress. therefore, suggested that the act to employ retired officers on duty be re-enacted but modified to meet the requirements ed as follows:

icers, when selected for retirement, will have their choice en the graded pay of the present Personnel Act before ess, or active duty ashore, while, on the retired list, until will have completed thirty years service, when they will no be employed and will receive three-fourths of the pay of grade. Retired officers will serve at training stations, on il courts-martial duty and with naval militia organizations officers on the active list, but officers on the active list of the grade will take precedence over retired officers.

ow is given a table, showing the strength of the Naval a on January 1, 1910. This strength should be increased old.

STRENGTH OF NAVAL MILITIA (ABOUT 107 DIVISIONS) JAN. 1, 1910.

State.	Commissioned officers.	Warrant officers.	Petty officers.	Men.	Total.
California	44	6	107	428	585
Connecticut	16	5	42	161	224
District of Columbia	14	..	50	93	157
Georgia	3	..	6	38	47
Illinois	50	..	114	473	637
Indiana	18	..	41	125	184
Louisiana	46	3	76	477	602
Maine	3	..	16	50	69
Maryland	17	5	110	162	294
Massachusetts	40	..	115	370	525
Michigan	41	..	66	233	340
Minnesota	11	..	17	106	134
Missouri	10	1	18	77	106
New Jersey	23	2	65	260	350
New York	52	..	90	678	820
North Carolina.....	32	4	70	258	364
Ohio	16	..	29	205	250
Pennsylvania	7	..	16	89	112
Rhode Island.......	15	2	49	160	226
South Carolina.....	19	..	37	150	206
Wisconsin	8	..	..	61	69
Total	485	28	1,134	4,654	6,301

Thus an officer with a family, selected for retirement, may be sure of ample means of caring for his family and the retired list will be actively engaged in serving the government. In time of war the retired officers actively engaged will first be called into service in their respective grades, and after them the officers not actively engaged and retired on graded pay. Three-fourths of those selected for retirement must serve on active duty. Officers retired for physical disability will not be considered in this relation, as such officers will be retired on three-fourths pay.

No officer will be advanced and retired except when coming up for promotion and physically disabled.

No officer shall be retired with the pay of rear-admiral unles he has served as such in command of a fleet, squadron or divisio for one year, or as chief of bureau. He may be retired with rela tive rank of rear-admiral, as at present allowed, except that h will not receive the retired pay as such, receiving the retired pa of captain only.

Rear-admirals serving as such in command of the followir navy yards may be retired as rear-admirals provided they hav

ıanded a ship of first or second class in active service while ng a cruise in the grade of captain, and provided they have in command of the navy yard for one year while in the grade ar-admiral.

NAVY YARDS.

Boston, Mass.
New York, N. Y.
Philadelphia, Pa.
Norfolk, Va.
Mare Island, Cal.
Puget Sound, Wash.
Washington, D. C.

is not a credit to the service that 40% of the retired list of nissioned personnel should be of flag rank, while a large numıave never commanded a ship and few have commanded ships ıe first class and served as rear-admiral in the proper duties ıch. Retired pay of flag rank is large and should be a reward 'aluable service in that rank.

is thought that these two systems will remove all opposition ongress and of the service, if applied to the new Personnel and will result in younger captains and rear-admirals, a conn affecting vitally the efficiency of the service.

ıe question of number of enlisted and commissioned personnel fficult of solution if a standard basis is to be applied. No lard will meet all conditions. In order to determine the numof men required, the following lists are appended. These lists that approximately 1864 line officers and 61,564 men are ired to man all ships of first, second and third rates, gunboats, edo craft, monitors and transports on January 1, 1913. The age of 1,003,499 does not include colliers, which would be ned by merchant crews, nor does it include wooden receiving . This means 123 men per 2000 tons.

the 1864 line officers above noted, as required to officer all ır ships, 25% should be added to allow for officers performing duty, on leave or sick leave, or changing stations. This rein 2330 line officers being necessary. To this should be added 0 midshipmen at the Academy, which brings the total number ıd 3000. It is, therefore, seen that the 3000 officers and 60,000 that would be authorized by the Personnel Bill are a necessity. Standard basis of five officers per 100 men per 2000 tons of acement meets the conditions as well as any standard and

some standard should be adopted to produce the necessary results as, after all, the results are the main consideration, the standard used being of minor importance.

BATTLESHIPS.

Name of ship.	Displacement.	Complement.	
		Line officers.	Men.
Indiana	10,288	19	619
Massachusetts	10,288	19	619
Oregon	10,288	19	619
Iowa	11,346	18	596
Kearsarge	11,520	19	636
Kentucky	11,520	19	630
Illinois	11,552	19	623
Alabama	11,552	19	623
Wisconsin	11,552	19	623
Maine	12,500	21	699
Missouri	12,500	21	699
Ohio	12,500	21	699
Virginia	14,948	24	795
Nebraska	14,948	24	795
Georgia	14,948	24	794
New Jersey	14,948	24	795
Rhode Island	14,948	24	794
Connecticut	16,000	25	841
Louisiana	16,000	25	841
Vermont	16,000	25	841
Kansas	16,000	25	841
Minnesota	16,000	25	841
New Hampshire	16,000	25	841
Mississippi	13,000	21	700
Idaho	13,000	21	700
South Carolina	16,000	21	701
Michigan	16,000	21	701
Delaware	20,000	25	827
North Dakota	20,000	25	822
Florida	21,825	25	824
Utah	21,825	25	824
Wyoming	26,000	27	005
Arkansas	26,000	27	905
New York	27,000	27	899
Texas	27,000	27	890
	555,796	795	26,417

47.5 per 1000 tons

Flagship of fleet (extra men required)	40
Seven divisions of 5 ships each—extra men for 7 flagships	160
Total for battleship fleet	26,617

Number of men equals 47.9 per 1000 tons.

ARMORED CRUISERS.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
Pennsylvania	13,680	23	776
West Virginia	13,680	23	776
California	13,680	23	776
Colorado	13,680	23	776
Maryland	13,680	23	776
South Dakota	13,680	23	776
Tennessee	14,500	25	839
Washington	14,500	25	839
North Carolina	14,500	25	839
Montana	14,500	25	839
Total	140,080	238	8,012
Two flagships (2 divisions)			46

Number of men equals 64.7 per 1000 tons.

CRUISERS, FIRST AND SECOND CLASS.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
Saratoga	8,150	14	451
Brooklyn	9,215	15	498
Charleston	9,700	20	650
Milwaukee	9,700	20	650
St. Louis	9,700	20	650
Baltimore	4,413	10	320
Chicago	4,500	11	350
Newark	4,083	9	282
Olympia	5,865	12	392
San Francisco	4,083	9	282
Total	69,409	140	4,525
Two flagships (extra men)			46
			4,571

Number of men equals 46 per 1000 tons.

SCOUT CRUISERS AND CRUISERS, THIRD CLASS.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
Birmingham	3,750	11	355
Chester	3,750	11	351
Salem	3,750	11	351
Chattanooga	3,200	9	292
Cleveland	3,200	9	292
Denver	3,200	9	292
Des Moines	3,200	9	292
Galveston	3,200	9	292
Tacoma	3,200	9	292
Albany	3,430	10	327
New Orleans	3,430	10	327
Cincinnati	3,183	9	289
Raleigh	3,183	9	289
Total	43,676	125	4,041

Number of men equals 92.5 per 1000 tons.

TORPEDO CRAFT.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
16 Destroyers, Nos. 1-16	7,128	48	1,200
5 Destroyers, Nos. 17-21	3,500	20	415
21 Destroyers, Nos. 22-42	15,582	84	1,722
8 Destroyers, Nos. 43-50	8,000	32	736
Total for 50 destroyers	34,210	184	4,073
Stringham	340	2	55
Farragut	270	2	62
Goldsborough	255	2	61
Bailey	280	2	57
15 Torpedo-boats (154-210 tons)	2,605	30	450
5 Torpedo-boats (142-150 tons)	756	10	120
3 Torpedo-boats (105-120 tons)	330	3	63
5 Torpedo-boats (30-65 tons)	252	5	65
	5,187	56	933
38 Submarines (about)	10,000	38	520
Total torpedo craft	49,397	278	5,526

Number of men equals 112 per 1000 tons.

MONITORS.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
Cheyenne	3,225	6	209
Ozark	3,225	6	209
Tallahassee	3,225	6	209
Tonopah	3,225	6	209
Monterey	4,084	6	210
Monadnock	3,990	6	210
Total	20,974	36	1,256

Number of men equals 60 per 1000 tons.

TRANSPORTS, ETC.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
Columbia	7,350	8	250
Minneapolis	7,350	8	250
Buffalo	6,000	5	171
Celtic	8,000	4	124
Culgoa	6,000	4	123
Glacier	8,325	4	130
Dixie	6,114	6	203
Panther	3,380	5	183
Prairie	6,620	5	172
Rainbow	4,360	5	174
Supply	4,325	5	132
Yosemite	1,197	5	128
Mayflower	3,050	6	166
Solace	5,700	..	112
Relief	3,300	..	55
Eagle	434	3	63
Hist	472	3	58
Scorpion	775	3	80
Sylph	152	1	28
Yankton	975	3	96
Pompey	3,085	3	74
Iris	6,100	3	116
Total	93,064	89	2,888

Number of men equals 31 per 1000 tons.

GUNBOATS.

Name of ship.	Displacement.	Complement. Line officers.	Complement. Men.
Annapolis	1,010	6	150
Princeton	1,010	6	150
Newport	1,010	6	150
Vicksburg	1,010	6	150
Nashville	1,371	6	171
Helena	1,392	6	177
Wilmington	1,392	6	177
Marietta	990	6	148
Wheeling	990	6	148
Alert	1,110	6	133
Callao	243	2	29
Elcano	620	4	97
Mindoro	170	2	21
Pampanga	243	2	29
Panay	170	2	21
Paragua	243	2	29
Quiros	350	3	54
Samar	243	2	29
Villalobos	370	3	54
Castine	1,177	6	138
Machias	1,177	6	138
Dolphin	1,486	6	125
Dubuque	1,085	6	154
Paducah	1,085	6	154
Petrel	890	6	131
Ranger	1,261	6	133
Yorktown	1,710	6	175
Bennington	1,710	6	175
Concord	1,710	6	175
Wolverine	685	3	82
Don Juan de Austria	1,130	6	145
Isla de Cuba	1,030	6	137
Isla de Luzon	1,030	6	137
Total	31,103	163	3,916

Number of men equals 126 per 1000 tons.

MISCELLANEOUS.

	No. of men.
Receiving ships (includes Mohican and Baltimore)	1,326
Prison ships and prisons	161
Training ships	517
Navy yards and stations	1,160
Tugs (44 in number)	552
Recruiting	200
	3,916
Fish Commission:	
Albatross (71), Fish Hawk (44)	115
Prisoners	860
Total miscellaneous	4,891

GRAND TOTAL.

(*Ships Serviceable for War Purposes Alone Considered.*)

Class of ships.	Displacement.	Complement.	
		Line officers.	Men.
Battleships	555,796	795	26,417
Armored cruisers	140,080	238	8,058
First and second-class cruisers	69,409	140	4,571
Scout and third-class cruisers	43,676	125	4,041
Torpedo craft	49,397	278	5,526
Monitors	20,974	36	1,256
Gunboats	31,103	163	3,916
Transports, etc.	93,064	89	4,888
Miscellaneous	......	...	4,891
	1,003,499	1,864	61,564

The Personnel Act of 1899 provides that when at the end of any fiscal year the average vacancies for the fiscal year above the grade of commander have been less than 13, above the grade of lieutenant-commander less than 20, above the grade of lieutenant less than 29, and above the grade of lieutenant (j. g.) less than 40, a board may select out sufficient officers to cause the vacancies above noted. But no more than 5 captains, 4 commanders, 4 lieutenant-commanders and two lieutenants may be selected out in any one year.

From July 1, 1911, to June 30, 1912, there are only five retirements due to age that will cause vacancies. By selection, 15

officers may be selected out. This will give 20 vacancies above the grade of lieutenant (j. g.). If 20 more vacancies do not occur by voluntary retirements, resignations or casualties, the 40 vacancies will not result. The same result will occur in the grades of commander, lieutenant-commander and lieutenant, and the 13, 20 and 29 vacancies above the respective grades will not be obtained. It, therefore, becomes necessary to produce a continuous flow of promotion that will result in younger officers for the higher grades. The Personnel Bill at present before Congress will produce the flow in a manner fair and just to all.

If promotion by selecting out to cause vacancies is not obtained, promotion by selection becomes a necessity and few in the service would welcome such a system with its accompanying evils.

From July 1, 1911, to July 1, 1919, there will be about 53 retirements from age, eliminating extra numbers. This will average just under 7 vacancies per annum due to retirements for age. With 15 retirements due to selection, 22 vacancies per annum above the grade of lieutenant (j. g.) will result. Casualties will not give the remaining 18 vacancies by any means and, therefore, about 30 vacancies, or three-fourths of the vacancies that should be affected, would result. It will be impossible to obtain the 20, 29 and 40 vacancies supposed to result from the Personnel Act of 1899 and consequently those now entering the grades enumerated below will take about 20% longer time to pass through the grades than noted in column "A" below, except in the case of commanders, as 13 vacancies above this grade are practically assured, resulting in passing through this grade in 9 years. Column "A" gives the number of years an officer is supposed to pass through the grade indicated, according to the Act of 1899. In column "B" is noted the time it took the senior in each grade on July 1, 1911, to pass through the grade:

	A	B
Commander	9	3.0
Lieutenant-commander	10	5.1
Lieutenant	12	6.0

It is, therefore, apparent that the grade of lieutenant (j. g.) is not the only grade vitally affected. With no personnel legislation, we now have the youngest captains and commanders that we shall have for many years to come and the ages of youngest in grade will rapidly increase.

The Department's present Personnel Bill certainly does remedy evils that are close upon us and should be studied closely by every officer. The bill is not complex, but is long and covers a vast amount of ground. Due to its length it is considered complex, but it becomes simple if carefully considered, section by section. Minor changes are necessary, however, to remove opposition and the bill should be discussed more in order to get the opinions of the service at large. If one is opposed to the bill there must be a reason and by giving reasons a better understanding among all concerned will result very quickly. To condemn a bill on general principles and without stating reasons is not logical.

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MESSAGE SIGNALLING IN THE FLEET.

By Lieut.-Commander Richard Drace White,
Late Fleet Signal Officer, Atlantic Fleet.

ıe question of signalling sometimes reminds me of Mark in's remark about the weather. He said that people were ys talking about it but nobody ever seemed to do anything t it.

ople *are* always talking about signalling. I do not know of ther branch of the fleet's work that is so extensively and freely ıssed. I do not know of any other fleet topic that arouses sympathetic interest—in talk. Nor is the talk insincere. y officers are thinking hard on the subject and are willing to go eat lengths to help signalling along. And as for doing things, bject of this paper is to show that Mark Twain's remark is ntirely apropos.

owever, the road to successful fleet signalling is not altogether n with roses. There are some boulders. For example, it is hing for a division officer to tell you what ought to be in the l line, and quite another for him to give up his prize loader e signal bridge; it is one thing to teach a sailor to punch holes a dotter in a grossly enlarged slow-moving bull's eye, and another to get this same horny handed sailor to saying his ers in semaphore; it is one thing to bring an offender at gun to a realizing sense of his error if he slows up a load and quite her to fix up a signal-man some two miles down the line who gles an innocent sounding message from the commander-in- and causes a great deal of trouble thereby.

ıat efficient signalling is essential to the fleet's efficiency, no who has been in the fleet can doubt. Much of the admini- ion that would otherwise have to be done by letters and guard may be done quite as thoroughly and with greatly increased

facility by signals. Much of it can be done only by signals. And as for comfort, it is impossible to estimate how much can be added to the comfort of those that live in the big ships if an efficient signal (telegraphic) service is maintained. One who has had the long used telephone taken out of his house can, in a measure, comprehend what it means. One who was recently tied up in the ice in the North River with many things happening, and the signal service gone bad also knows what it means. We are prone to appreciate our luxuries only when we have lost them.

There are many things that go to make up efficiency in fleet signalling. Men, material, methods, esprit, bridge discipline, all leave their mark on the output as they do nowhere else in the fleet. It is an ever changing, unstable, flighty, bit of man machinery that must be carefully watched and managed all the time if it is to be made and kept the dependable usable instrument that a proper signal service should be.

First of all, of course, in the making of a signal service is the man on the bridge. That he is difficult to get goes without saying. A specially intelligent, willing, trustworthy man is required. The work is fine to the point of expertness; it is frequently disagreeable since it must be carried on in foul weather as well as fair; it is trying in that it comes in lumps with large spaces of inactivity interspersed; and its proper performance must of necessity rest largely on the esprit of the signalman himself, since the supervision exercised is, as a rule, limited—in fact the supervision actually exercised develops too frequently into the nagging variety, the inevitable result of supervision by many masters. There is not really any live inducement to get men to the bridge. The extra pay of a signalman, is to be sure, three dollars, two, one or nothing depending on his class, but he is practically the only unrated man in the deck force required to stand night watches in port as well as at sea, he is actually at work a great deal of the time when his messmates are free to do as they like, his work is very disagreeable in bad weather during most of which his messmates are under shelter, and he is robbed of many opportunities for advancement that his messmates enjoy. For example, a man on deck, if he has the intelligence, handiness and other good qualities essential in a really good signalman, can, with much less effort than is required of a signalman in the latter's regular routine work, become a gun pointer and get ten dollars extra a month, and once he has obtained

classification can retain it a year with practically no effort at He also stands a better chance of advancement, since his good k is always visible to the division officer, the real governor of future, whereas the signalman only comes to the attention of division officer to explain some fault he is supposed to have mitted. Naturally the division officer finds it difficult to see hing good in a signalman. As for the rating of quartermaster, rate always looked to as the logical reward for a signalman, it ore apt to be given to a good helmsman than to a signal bridge . The inducements, as may be gathered, are meager. Good are, naturally, hard to get.

ow come to the signal officer. In regard to the battery, the ain shall assign officers to command of gun, powder and edo divisions in a manner that will, in his judgment, most con- to the efficiency of the ship as a whole, and shall make no ges in such assignment except to the same end. As for sig- ng, he usually assigns as signal officer a midshipman from the class to join the ship regardless of whether or not he has shown self capable of handling a difficult situation, removes him or aces him as circumstances seem to warrant and even goes with- a signal officer for long periods at a time, detailing one for the sion if the signal officer is sent for by the commander-in-chief. ut to go back to the man on the bridge, the question of the il of men for signal duty is really a serious one. The deck plement of a ship is based on her guns. Enough men, outside pecial branches, are allowed the ship to man the guns. Sig- en used to be detailed from men supplied to the ship primarily an the guns. A certain number of signalmen, to be sure, no gun stations, but generally speaking the first duty of sig- en was at the guns. There was therefore a certain amount iction between the signal officer and the division officers as to mployment of these doubly employed men. It was difficult to out systematic work on the signal bridge on account of the ent calls on the signalmen for work at the guns. The good of the signal force generally occupied important gun stations, were therefore required to be absent from the bridge a great of the time. Furthermore, the employment of these men at the left the signal force reduced, when the crew was at battle sta- , to less than the force employed on the bridge in ordinary ma- ers and did not in any measure provide for reliefs for casualties

policy of restricting signalmen to signal duty only threaded-
ious road to success. It meant in the first place, complete
nization of the signal force of practically every ship in the
for practically all the good men in the signal force were special
t the guns—pointers, captains, loaders or such—and as the
had first claim, the signal force was for a while almost entirely
up of green men. This situation was to be expected, for the
qualities that make a man a good signalman make him good
other work, particularly at the guns. Still, the situation
ing from the change was, I must confess, rather shocking.
nd, however, justified the means, and once the new gang was
to shape it was luxury to the signal officer compared to what
sk had been before.

e recruiting of new men for the signal force to provide for
lties, such as expirations of enlistments and discharge of
less men from the bridge, is however always a difficult one.
men are wanted in other places and, whereas there is always
place in division work where a mediocre man may be
yed to advantage, there is no such place on the signal bridge.
se signal officer therefore always has a few likely suspects
his lee whom he may call on in time of trouble. This was
ged for in the flagship by augmenting the signal force during
eriods of slack gun drills, such as repair periods at the yard,
ending the extras back to their divisions when the work at the
began again. In this way men were trained so that in case
ed they could be called to the bridge with a minimum result-
onfusion.

as been frequently proposed to have a special signal corps for
vy, such as is provided for the army. I have always doubted
isdom of such a provision. Many men can never make good
men. Others, although they can do so, do not, after they
ried the work, want to make good ones. It is therefore well
e an easy way to be rid of such men. The most salutary
ment that can be inflicted on a member of the signal force
ut him temporarily or permanently off the bridge. This, it
ious, could not be freely done if signalmen formed a special

making of a signalman is interesting. Very few men of the
ivisions learn to signal sufficiently well by the signal drills
eld to make them of particular value to the signal officer until

they are specially trained. When a new man comes on the bridge he is about as well off if he does not know any signals at all. He will at least learn right when he does learn. Drill has very little to do with a signalman's efficiency. It is work that is needed. New and old alike have to be kept actually signalling practically all the time if they are to be kept efficient. Signalmen never tire of actual work at signals. It is the drill that makes them want to get off the bridge.

But plenty of work is not always to be had. Ships separate and go to the yards. Business gets dull even when the fleet is together. These are the times that the signal officer dreads. Many schemes have been tried to keep the force up and interested. I say interested because, unless the men are interested, a signal drill is worthless as no other drill can be. Signalling in cipher has proved very good, but it is difficult to do enough of that. P. D. L. work on time and accuracy test is good when mistakes and delays are pointed out to the offenders, but that too is difficult to keep going. One scheme that has proved very successful is to use a buzzer something after the fashion practised at the wireless school at the New York Yard. One man is detailed to send while the others, each supplied with pencil and pad, read and record as the message is received. This demands a minimum supervision on the part of the signal officer. A glance at the sheets turned in reveals the progress of each man, and, best of all, it gives a line on men capable of making good recorders. (It is a curious fact that the recorder is almost the most important man in the watch and good recorders are more difficult to develop than good signalmen.) Encouragement along certain lines helps a great deal. If, when signalmen on watch are not actually engaged in signalling with other ships, they can be induced of their own free will to signal to each other, they will be kept in good shape with practically no effort on the part of the signal officer. The practice of permitting signalmen to signal between ships when no work is going on helps no end. It has been employed successfully for several years in the fleet and except for minor friction, usually caused by misunderstanding on the part of some new signalman, no harm has ever come of it. It is practised in all telegraph and cable concerns and is worthy of all encouragement.

One of the most difficult things to contend with is the tendency of signalmen to fall into the exclusive use of one code, to the detr-

of efficiency in all other codes. Of course the ideal signal n would employ one code only. Men could easily be made ient in that. Telegraphers and wireless operators who y only one code get so they fairly think in the code. It es second nature to them. They read in the code as one arily reads print. But it is a condition not a theory that we to struggle with now, and signalmen must be kept proficient

signalmen were allowed to choose they would never use any- but the semaphore. In fact until certain precautions were in the fleet that was practically all that was used. This does usly while the ships remain in close formation, but when they ate, as when carrying out target practice, the semaphore es a complete loss. Signalmen who are expert at short s cannot read semaphore messages where wigwag signals e plainly made out. Then there is of course a great deal of when only shutter searchlight work is possible. On one ion the signal force, which had been working faultlessly while eet was together, became completely paralyzed upon its sepa- n for target practice. While expert at semaphore work they quite at a loss at the codes that the situation required to be One experience of this kind was enough. Signalmen were red thereafter to transmit regularly a certain part of the work archlight, blinker or wigwag regardless of the distance, and difficulty in this respect was subsequently experienced.

e mere training of men to send and receive signals is, however, a part of the signal officer's business. The organization, the ing of errors, the speeding up in order that the work in hand ne, the bridge discipline, the requirement of smartness in order he spirit may be maintained, are all points that must be kept n mind. Team work puts its stamp on signal work as defi- as it does in gunnery. Unless some definite arrangement for ocking the work is made, a bridge can become a torment of sion second only to Babel itself. Let a call be seen and the watch will, unless curbed, rush into the fray. They will back and forth, read the signal each man for himself, com- y rob it of all meaning and end in loud impeachment of each s intelligence. In the meantime any other call that flies is y disregarded.

As a matter of fact team work comes naturally on the bridge. The arrangement on the flagship's bridge was to have the watch divided into pairs, one man of each pair to actually signal, the other to record. In sending, the recorder read off the message if necessary. In sending to more than one ship, where several senders had to be employed at once, one man read while three sent. In receiving, one read while the other recorded. The men of each pair always worked together. The calling of a signalman also meant the calling of his recorder. With four signalmen and a quartermaster in the watch two signals could always be received or sent at the same time. And as the chief quartermaster and the relief watch were always called when the work was heavy, it was not unusual to see five messages being handled at once, with practically no confusion.

There is one requirement of an efficient signal service that deserves mention for its oddity, and that is that it get through unfailingly all messages entrusted to its care, or when this is impossible, report the failure to do so. It seems odd that this question should come up at all, but it is surprising how easy it is for signals to simply disappear in transit unless some special means are taken to prevent it; and further how extremely difficult it frequently is to fix the responsibility in such a case. The greatest step towards eradicating this evil is accomplished when signalmen are brought to realize that it is the sender's duty, not merely to send but to see that the receiver understands, and that he must persist in his sending until satisfied that this is done.

To be really efficient the service must also be rapid. A message given to the signal bridge must, as a rule, be sent immediately, otherwise it is better to use the guard mail or send a special boat. It is astonishing how the time required to get signals through mounts up if any laxity in this regard is admitted. Strange as it may seem the rapidity of the code employed has very little to do with this feature of signalling. Occasionally a fast code will get a signal through which would be lost entirely if a slow code were used, but this is exceptional; and as for the ordinary work, the delays in getting the message to the bridge, of getting the next ship's attention, and of getting it delivered at the other end are the things that have most to be struggled with. As to getting the receiving ship's attention it may be put down as an axiom that the best ship at signalling is the one that keeps the best lookout.

paramount problem of signalling, however, is the necessity curacy. Unless it can be confidently assumed that a signal delivered without error in practically every instance the sig- rvice comes near being worthless. When you consider the es from which errors may come in signalling, it is surprising atisfactory accuracy is ever attained. Compare a message sent legram with the ordinary signal. In the first place the man has the telegram sent is usually paying for the privilege. He refore careful to see that no fault of his forbids its getting gh correctly. He writes out his messages as legibly as he can. is a bad writer he prints it. He puts it on a regular blank, s his words and gives it to the operator. The operator sits in an easy chair, in a warm office, with the copy before him, ends it over the wire. The receiver, also in a comfortable in a comfortable office, reads and records it as it comes. He s the words, files the message, and sends it out.

e conditions surrounding signalling are different. If so and nts to send a signal he scribbles it off on whatever is at or he may send an orderly or a mess boy up to say please so and so. Maybe he shouts the message up to the bridge the deck. In this practice alone there is abundant chance of As a rule one signalman must read while another sends, er source of error. If the signalman is careless in his manner king his letters by semaphore there is a fertile chance of error, e receiver is frequently so anxious to make good that if a merely waves his arms from one bridge the signalman on her will get some word out of it. Moreover there are many that are, naturally, easily confused when sent by semaphore. a ship has had to shift berth because northwest and southwest most identical when spelled out by semaphore. There was icer in the fleet whose name almost baffled all efforts to send signal. That was Lieutenant Conn. No receiving signal- ould be induced to read it anything but Lieutenant Com (the meaning commander) and growl at the fool on the other that left out the officer's name.

n take the receiving ship. The man that reads the signal record it himself. He must have another man record for nother source of error. The recording must be done in all of weather. Frequently proper pads and pencils are not ed. Often the recorder is not a literary person and his

spelling is not like that of other men. And there are many other sources of error. In fact they are so numerous and so perverse that their stoppage in entirety seems almost hopeless. Still by systematic vigilance a surprising accuracy can be secured, and it is worth working for. The steps taken to secure this accuracy in the fleet are, I believe, worthy of recital.

A checking system was established which, although it appeared elaborate, was systematized into comparative simplicity. It consisted of first adopting a standard signal blank resembling the forms used in the Western Union and Postal Telegraph Offices, and requiring that all signals be inscribed on these forms before they were sent, if practicable. Each ship was required to adhere strictly to the standard form, even in regard to the size to which the form was cut, as any variation hampered the officer charged with the duty of comparing the records of the various ships, a task of considerable difficulty at best. These forms contained, in addition to blank places for the words of the message, places, each in its standard position for, (a) the ship to which the message was sent or from which received, (b) the name of the person addressed, if the message was addressed to any particular person, (c) the date, (d) the time at which the message was acknowledged, (e) the number of words in the message, (f) the name of the officer or petty officer actually in charge of the bridge when the message was handled, and (g) the name of the signalman sending or receiving the message. In addition to this, the name of the ship on which the blank was used was printed in bold type across the top of the form. These forms were kept in pads in officers' messrooms, staterooms, offices and elsewhere, and their use was easily made general. In addition to the regular record it was required that one copy of every message sent or received be filed and forwarded for comparison to the flagship by the first guard mail after the day was completed. Carbons were used whenever practicable to facilitate the making of the extra copy and also to avoid errors of copying.

In sending, the sender himself was required to read off the message whenever practicable and when not practicable to be sure of every word read off to him before it was sent. In receiving, the signalman who actually received the message was required to take the blank from the recorder, read it over, and when satisfied as to its accuracy, to sign it in a space reserved for his signature. This fixed the responsibility for one class of errors that had hitherto been

flagrant. It is curious to note that this practice, instead of being shirked by the signalmen, was thoroughly liked by them. Some feeling of pride or responsibility seemed to be aroused by their overseeing and checking the work of somebody else.

After the receiver had checked and initialed the message it was given to the officer or petty officer in charge of the signal watch who also read over and initialed it, and then, and not until then, was the message ready for delivery. In case the officer in charge of the signal watch found anything improper about the signal or if it appeared to lack sense, he would have the signal repeated. In this way many of the errors were intercepted right on the bridge, for the officer in charge of the watch, knowing what was going on, could frequently detect errors in signals that would not be apparent to one not acquainted with the situation. Having initialed the message the officer in charge of the signal watch would send one copy to its proper destination and file the other to be sent on the succeeding day by guard boat to the flagship for comparison.

When all copies had been received on the flagship they were compared, and the errors noted and brought to the attention of the offending ships. From the data on the blanks the responsibility for error could be placed not only on the ship but on the watch and even on the signalman making the error. A tabular record was kept of the number of errors made by each ship and signalman in the fleet, so that all hands were on a competitive basis all the time. It soon became apparent not only what ships were poor but what signalmen on those ships were causing the weakness.

The employment of this checking system reduced the errors tremendously. The strictest count was kept. Misspelled words although their meaning was apparent were counted as errors. Moreover when a mistake was made it was counted against the sender as well as the receiver. And even with so strict an accounting maintained, there were cases of ships handling several hundred words a day, going for a week with as few as four errors.

The plan of counting errors against the sending as well as the receiving ship met at first with opposition, but it is, in my opinion, to the best interest of signalling, to so count it. In the first place it serves to bear in upon all that the responsibility of the sender does not end with his merely having sent the signal but only with his having made the receiver understand it. In this connection I am

inclined to believe that the majority of errors made are due to faulty sending.

In calculating the errors made by the various ships, efficiency was rated according to the number of mistakes made in handling so many words, not simply the actual number made, for a ship handling a large amount of work will naturally make more mistakes than those handling only a small amount. The fairness of this must be generally acknowledged.

In counting the number of words handled by the various ships frequent surprises developed. Surprises that some ships handled so few words, and that others handled so many. Some ships would run along with a hundred a day. Others would go to a thousand. The record day for the flagship was something near three thousand. There are twenty-four hours in a day, therefore the average was over a hundred words an hour, and as very little signalling is done during the middle of the night there must have been handled during some hours from two to three hundred words. In the three thousand words in question there were eight errors, most of them misspelled words, which shows what can be done.

Generally speaking, the problem of message signalling in the fleet does not differ vastly from the problem that confronts the big telegraph companies of our country. Much may therefore be learned by adopting the methods used by those companies. In any event the aim should be to provide the fleet with as good a telegraphic service as is provided by them for the people at large. Perhaps such a service can never be attained, for the difficulties facing its accomplishment are great; but the service that is can be made surprisingly good. Keep the fleet together, give the signal force plenty of work, remove from the sending of signals the requirement that some special formality be complied with before the privilege becomes active, make the sending of signals as free as the posting of a letter (the two are analogous), demand a quick, accurate, dependable service and it is surprising how quickly the service will respond to the demand.

Altogether signalling in a live fleet, is bound to be a big problem. Its very life depends on its being kept big and its proper solution on its being regarded as big. The millenium is, of course, never reached but it can be so nearly approached as to make the signal service of a fleet a splendid asset to the fleet's efficiency and that is all any form of fleet work can properly become.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE DESTRUCTION OF THE LIBERTÉ.

By Lieut.-Commander Ralph Earle, U. S. Navy.

e battleship *Liberté*, 14,868 tons displacement, forming one e units of the second battleship squadron under the command ice-Admiral Bellue, anchored in the harbor of Toulon, was oyed by fire and explosion on Monday morning, September 1911.

e weather was beautiful, and the ship had just started to g to a light breeze on starboard bow. Soon after reveille had ded, and while the crew were scrubbing clothes on deck, a , as of escaping steam, was heard together with a heavy d or rumbling. This was at 5.17, and yellow acrid smoke a powder smell issuing by way of the ammunition hoists and lation pipes from the starboard forward 7".6 magazines was kly followed by blue and then yellow jets of flame. These es with thick and suffocating smoke filled the ship rapidly. crew went to fire quarters quickly, Lieutenant Bignon in ge, and unsuccessful efforts were made to flood the maga- . The men endeavoring to do this were driven from forward is heavy yellow acrid smoke. Possibly also the intense heat e fire had bent the operating gears of the flood valves.

e chief engineer, Lestin, in obeying a second order to flood orward magazines, saying, "I've already tried," started for- l again but never returned. About 5.27 to 5.35—time variously ated within these limits—an explosion occurred under the ast sending up a thick column of smoke followed by flames; other explosions followed at intervals, the first putting out e lights on board, thus adding to the difficulty of controlling ts. Assistance was signalled for and sent promptly by the vessels of the squadron.

Lieutenant Garnier took charge about this time, and, the flames seemingly subsiding, countermanded an order of Lieutenant Bignon to flood the central and after magazines, until he could learn more definitely the exact condition of affairs, and to quiet the growing panic.

The interior of the hull was burning, and from time to time jets of flame shot out of the foremast, these being caused by the explosion of boxes of 9 and 3 pounder ammunition.

The call to quarters was sounded, and the crew went to their stations bravely, and even those who had jumped overboard in the first panic endeavored to reboard the ship to return to their stations. Water could not be obtained in sufficient quantity in fire hoses, the attempts to flood forward magazines were failures, the whole inside of the ship was a furnace in which were burning all sorts of combustible material, bags, hammocks, linoleum, etc., and a thick smoke penetrated everywhere. The order was given to flood the amidship magazines, but the smoke and darkness rendered this impossible of accomplishment. The temperature between decks rose rapidly. The order at last was given to abandon ship. Then at 5.53, *i. e.,* just twenty minutes after the first explosion, came the final and tremendous explosion which converted the *Liberté* into a mass of shapeless and half-sunken débris. The roadstead was covered with wreckage and the maelstrom caused by the explosion swallowed up many boats sent by other vessels to the rescue. This explosion was heard for over thirty miles.

From the testimony of Says, an artificer, who escaped miraculously, we learn that at the moment of this explosion, Lestin, and master machinists Champilly and Steiner, the latter wounded and covered with blood, refusing to save themselves, were on the berth deck struggling with the locks of the flood valves to the amidship magazines. Surely this was heroism of the highest type.

Débris was hurled in all directions, causing damage and death to other vessels of the squadron and to the rescuers.

The *République* was struck by a mass of armour, weighing several tons, about fifty feet forward of the stern, her plates were stove in and ripped off for a distance of twenty to thirty feet, and half-way down to the water line. The *Liberté's* forebridge and two 12″ shells landed also on the *République*. The damage to her was so great that she was docked as soon as possible.

he *Démocratie* was the next heaviest sufferer. In addition to above two vessels, the following sustained damage and loss of *Vérité, Justice, Jules Ferry, Michelet, Foudre, St. Louis, ot, Marseillaise* and *Edgar Quinet*.

he final official figures as to the loss of life on the *Liberté* and above mentioned vessels are:

204 killed or missing
136 wounded, and
48 slightly injured.

he decks, including two 7".6 turrets, of the *Liberté* from abaft forward boiler rooms and turrets were blown upward, back-d, and doubled up on the quarter-deck of the vessel. The vard part containing the two forward funnels has disappeared. vessel is now simply a mass of twisted and entangled plates, together with detached fragments renders navigation in the dstead of Toulon very hazardous.

CAUSE OF THE DISASTER.

committee, headed by Rear-Admiral Gaschard, made a ough inquiry, and, despite the ugly rumors as to socialism and evolence have reported as follows:

1) That there was no trace of malevolence.

2) That the supposition that a fire either in magazines or in acent parts of the ship started decomposition of powder is dis-red; and that

3) The spontaneous ignition of a charge in the forward star-rd upper 7".6 magazine was the source of the disaster; and

4) No blame is to be attached to officers or crew, all regula-s having been complied with.

he conclusions of this committee in general are:

1) The burning of the powder, which twenty minutes later loded the shells, and transformed the *Liberté* into a terrible ck, started in a 7".6 magazine and not in the 9 or 3 pounder gazine.

2) That in this 7".6 magazine there were *no* exercise, *i. e.*, get practice, powders, all such having been expended at the vious target practice. The gunnery officer of the *Liberté* is y positive on this point.

3) That the oldest B powder in this magazine dated only 1906, that the other lots of B powder were of dates, 1907, 1908, 1909

and 1910. All these lots carried the same mark, $BM_{13}AM_{4}$ (amyl alcohol as solvent, 8%).

(4) That, therefore, the oldest B powder to which the explosion can be attributed was aged but five years; and

(5) That, by deduction, powders of the B type, five or more years old, can spontaneously ignite.

The powder in question was made at the Pont de Buis factory in 1906. As this lot of powder was looked upon as absolutely reliable, considerable uneasiness has naturally been caused in France by these conclusions. The fact that use of amyl alcohol in manufacture has been abandoned recently leaves a possibility that the powder made in recent years and now in service, will not thus prove unreliable. That its use was deleterious, however, is by no means a point that is agreed upon by chemists.

The destruction of the *Liberté* was thus started by the spontaneous decomposition of a charge of 7".6 ammunition. This set fire probably to the woodwork of the magazine, and the heat caused other charges to explode, not as a detonation, but as a blast furnace or escaping steam, thus adding to the heat in the magazine, and finally causing the melinite shells to burst. The bursting of shells loaded with melinite caused the destruction of the vessel. In the forward magazine there were 142 semi-armor piercing and 101 armor piercing 7".6 melinite shells. In the amidship magazine there were 388 melinite and 104 black a. p., and s. a. p. 7".6 shells. There is some doubt as to whether the shells of the forward magazine exploded, as the damage done to the ship seemingly indicates that the heavy explosion which destroyed the ship occurred in the amidship magazine.

RESULTS OF THE DISASTER.

M. Delcassé, Minister of Marine, has ordered that, hereafter, 4 years is to be considered the limit of age for B powders considered suitable for aboard ship, and this limitation will likely be extended to magazines on shore. This is an expensive step, but, in the uncertainty which at present exists, it seems a wise one.

The monopoly held by "Les Poudres et Salpêtres" has been broken and placed under control.

Naval officers will, in future, control and inspect the manufacture of powder.

e capacity of the factories of "Les Poudres et Salpêtres" has ordered largely increased, and is now turning out 3000 tons powder with diplenylamine used as a stabilizer in place of ow-apparently discredited amyl alcohol.

e factories controlled by the Bureau of Poudres et Salpêtres held to be guilty of:

) Bad workmanship, particularly as to the purity of the raw rials used, the purification of its nitrocellulose, and thorough- of carrying out the various steps in manufacture.

) Slow and costly manufacture; some fifty-five cents per d avoirdupois.

) Deceiving its customers; *i. e.*, the naval officers.

) Refusing to experiment with and improve its product.

) Sticking to one standard routine.

a result of the *Iéna* explosion, black and brown powders were rately stored from B powders; additional inspections were ided also. The temperatures permissible for magazines were ually reduced from 40° C. (104° F.), to 35° C. (95° F.), then C. (89.6° F.), and now 25° C. (77° F.) is to be the limit. does not appear to be the result of any sound reasoning or riments however. During recent naval manoeuvers tempera- s over 30° C. or 86° F. were continually registered, showing omparative inefficiency of the isolating system between maga- s adopted for the *Patrie* class after the *Iéna* disaster.

he cooling and flooding appliances on board all fighting vessels been minutely investigated, and tested and practical means nprove them are to be adopted without delay. A few con- ctors are to be sent to the English fleet to study methods there. said that the arrangements for flooding magazines were so ractical that, even were they in good order on the *Liberté*, they ld have been powerless to save that ship in case of spontaneous mposition. They are called "a challenge to common sense" aval officers. In case of *St. Louis* class of French battleships, ninutes are required to flood the after 12" magazines. The er is brought to the lower level and not to the top of the maga- s.

committee of eminent specialists has been formed to examine t practical steps it is desirable to take in order to improve the ility and quality of the B powder, and to consider the question odifying its composition.

B powder is composed of two kinds of nitrocellulose, soluble and insoluble, of 11.60 and 13.23% nitration, respectively. Amyl alcohol was until very recently the solvent. The use of this has recently been the object of much adverse criticism, though the claim has always been made that its introduction doubled the life of the powder. The French have now given it up for the ethyl alcohol, and diphenylamine is used as a stabilizer.

The nitrocellulose is manufactured at one factory, the powder at another, a practice we have given up years ago as unreliable. The required stability test of nitrocellulose with potassium iodide starch paper at 65.5° C. is but 20 minutes. A very faulty purification could easily give this, and inspectors easily be hoodwinked.

The powder is made in ribbon form, and the variation in its ballistic qualities is made by variation in the percentages of the soluble and insoluble nitrocellulose in its composition, and not by varying the web thickness.

The processes used in French manufacture differ radically from those of the United States, particularly as regards attention to detail and thoroughness of purification in all the various steps. The stability of any nitrocellulose powder is absolutely dependent on the quality of the raw materials and on the thoroughness with which the details and purification processes are carried out step by step in its manufacture. The French process of drying is complicated, and includes water drying, which was abandoned, after experimentation, in the United States as injurious to the stability of the material. It seems strange that powder manufactured in the country of its inventor should not be as stable as a similar production of another nation, but such appears to be the fact.

There is in France at this time also a general complaint relative to the keeping qualities of sporting powders, the defects of which are attributed entirely to *careless* manufacture.

Thus we see that the stability of French nitrocellulose powders cannot be considered in the same light as ours. Over ten years ago stringent regulations were prepared by our powder board, it detailing exactly what purification must be given to our materials, and then to our powder in all its various processes of manufacture. These have been the cause of the high stability of our powders. It is seen that in France no one connected with the navy inspected the processes of manufacture, which inspection is here most thorough. In the majority of cases our powders are still stable

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CHEAPER PAINT FOR THE NAVY.

By Naval Constructor Henry Williams, U. S. Navy.

"Everywhere the paint and shellac was of excessive thickness, in places being more than one quarter of an inch thick."—*Recent report of inspection of a naval vessel.*

Paint materials form one of the most important classes of naval supplies, and their use has contributed to many officers' reputations for efficiency through the aid they lend in making a "smart ship." There was at one time a general understanding in the British navy, reflected somewhat in ours, that no officer could aspire to the command of a first class man-of-war who, as executive officer of a similar ship, had not kept a "smart ship." This included the liberal and proper use of paint, provided often at the officer's own expense.

In these days military efficiency is the main consideration in estimating an officer's value and paint materials cannot be considered as affecting this, other than indirectly. On the other hand, economy is being urged on all sides, and the proper and economical use of paints generally has not been given serious consideration, at least not until recently.

In order that the importance of the subject from this point of view may be judged, the value of the purchases for the year 1910 of the more important paint materials is given:

White lead	$125,000
White zinc	80,000
Red lead	50,000
Linseed oil	100,000
Japan drier	17,000
Turpentine	70,000
Shellac	135,000
Alcohol	49,000

These figures though only approximate will serve to show the relative importance from a monetary point of view of the various

backward in such matters. This important part of the subject will be discussed more fully in another place.

In order that a discussion of painting materials may be profitable it seems appropriate to state the characteristics and limitations of the more important of the paint materials now commonly utilized in the navy.

WHITE LEAD.

This is the white pigment most generally used and it enjoys a well deserved popularity among painters. For two thousand years white lead was the only white pigment used. The process by which it is manufactured most generally, known as the old Dutch process, has been in use practically unchanged for centuries, a description of it being found in Pliny's writings. It consists essentially of a slow corrosion of buckles of metallic lead in earthenware pots which contain acetic acid and tanbark. Carbonic acid is liberated from the tanbark and acting on the lead converts it into a hydrated carbonate of lead. White lead when mixed for painting purposes combines with the linseed oil, forming an unctuous substance known as "lead soap." This accounts, in a measure, for the popularity of white lead with the practical painter, who by the feel of the paint on his brush and the ease of application readily determines whether it has been made with white lead, or with "adulterants." It is a fact generally admitted that a paint made with white lead alone is not so durable as when white zinc, or even when the so-called "fillers," such as barium sulphate, silica, or similar materials are added.

For naval purposes white lead has one serious defect in its susceptibility to the action of sulphur gases. Who on board ship has not seen freshly applied white paint turn black, due to this cause? Generally for this reason the last coat of white paint to be applied to interiors of ships consists exclusively of white zinc.

WHITE ZINC.

White zinc or zinc oxide as a paint pigment is about sixty years old and in that time has gained a well deserved popularity. It is produced by heating metallic zinc in retorts until it vaporizes. In this condition it is passed into chambers where it oxidizes and falls as a white impalpable powder. One of the by-products is the zinc dust which is used in the manufacture of the Norfolk Shipbottom Paint. White zinc is graded according to whiteness

Paint made in this way is probably more efficient than if made with red lead only and will keep without hardening.

Red lead is used on board ship for many purposes for which it is absolutely unsuited and where paint costing less than half as much would give better service. These locations are coal bunkers, double bottoms, trimming tanks, and bilges. The difficulty that is encountered on the average ship in keeping the metal on these locations painted furnishes abundant proof that red lead is not suitable. It is a safe rule to follow that red lead is efficacious only for use as a priming coat, where other kinds of paint are applied over it and in locations where the metal can be rendered absolutely dry before painting. This refers especially to moisture that condenses on the metal in such spaces as double bottoms. Red lead is acted on with ease by sulphur gases when unprotected by another paint. It requires about 33 pounds of red lead to mix with a gallon of linseed oil, so that the cost per gallon of red lead paint is something over $2.00. It is difficult to get painters to apply it properly, due to its weight and the fatigue resulting from handling the paint brush heavy with paint. For that reason there is a tendency to dilute it unduly. Some grades of red lead are coarse and crystalline, and are not so efficient as the finely divided varieties. For this reason one of the laboratory tests is an examination of red lead under the microscope in comparison with a standard sample.

SHELLAC.

The United States navy is probably the largest single consumer of shellac, of which about half a million pounds are purchased annually and used largely to make varnish for linoleum covered decks of ships. Recently considerable quantities have been used in making ship's bottom paint.

Shellac gum, unlike other varnish gums, is not a fossil but is an annual crop. It is obtained from the secretion of innumerable small bugs which feed on the leaves of a bush growing in India and Siam. The secretion, which hardens, is called "stick-lac" and is collected by natives who take it to the factories, where it is ground, sifted, washed and winnowed and afterwards heated and spread into thin sheets to form the gum shellac of commerce. It is adulterated frequently with ordinary rosin, of which large quantities are shipped to India for the purpose.

TURPENTINE.

Turpentine has been used for many generations as a solvent for paints and varnishes. It is manufactured from the sap of several species of pine trees, by distilling with steam. Due to the destructive methods employed in gathering turpentine the supply has decreased enormously in recent years, and the price has increased correspondingly. Unless these methods are interfered with, it is likely that in the lifetime of the present generation turpentine will become a chemical curiosity. It is used to mix with paints as a diluent or extender, its function is mechanical, being simply to increase the spreading power and working quality of the paint. It evaporates leaving no residue, so it cannot be said that it contributes except indirectly to the life or quality of the paint film. It is generally admitted now that entirely too much stress is laid upon the value of turpentine as a paint vehicle, and when this is realized, substitutes will be used that serve the purpose quite as well and in many cases better than turpentine itself.

Due to the scarcity of sap turpentine, of recent years so-called wood turpentine has been manufactured extensively. This is made by the distillation in retorts of sawdust, shavings, old logs and roots of pine trees. The quality of these turpentines depends upon the method and care used in their manufacture, many of them being the equals in every respect, except possibly as to odor, of the sap turpentine. Others have very disagreeable odors and injurious properties due to the products formed in the destructive distillation of the wood. For exterior painting these wood turpentines generally are quite as efficient as the sap turpentine. For interior painting their odor in most cases condemns them. In general they cannot be said to have any advantage over benzine products, which are supplied for the same purposes.

The navy department purchased in the year 1910 about 75,000 gallons of turpentine under specifications that required delivery of the highest grade of sap turpentine that it is possible to obtain, and consequently at prices somewhat higher than the market. This turpentine was used by the navy for paints of the sort in which manufacturers of ready mixed paints would not consider using other than benzine products as solvents. Consideration of these facts led to the decision early in 1911 to discontinue the purchase of sap turpentines except for special purposes and to purchase for general use in paints a turpentine substitute which

had been shown by test to meet all practical requirements. This material is a petroleum product similar to benzine, but with higher flash point. It evaporates at a temperature of 212° F. with no residue. The use of the material has met with some opposition in the navy, reports have been submitted as to its unsatisfactory qualities. It should be borne in mind, however, that it is a commercial product used very extensively commercially for the same purposes as the navy uses it, and any failure consequently should be considered rather as the fault of the persons using it than of the material. It is likely also that failures due to other causes are attributed to the use of the turpentine substitute. A conservative estimate of the saving to the navy resulting from the use of turpentine substitute is $30,000 annually. One of the objections advanced frequently and with effect against petroleum thinners is the belief that they have a tendency to cause white paints to turn yellow. That this is true is doubtful. The author has never been able to understand that very white paint should be necessary on board ship, and in discussing the matter with expert house decorators finds that from artistic considerations they favor a cream or light yellow rather than dead white. This tint permits the use of more suitable varnish in the gloss paint, as will be pointed out further along.

IRON OXIDE PAINTS.

Large quantities of venetian red are purchased in the navy for coloring the shellac varnish used on linoleum decks. It consists largely of calcium sulphate or gypsum, the remainder being about 30 per cent of iron oxide. One of the most durable of the proprietary metal paints tested at the Brooklyn Navy Yard has a pigment consisting of venetian red.

Indian red is a natural oxide of iron, practically pure, and is used as a coloring matter in the Norfolk anti-fouling ship-bottom paint, in order that it may be distinguished readily from the anti-corrosive.

Metallic brown is another oxide of iron—the best grades being the natural ones. It is used very extensively commercially on steel with success and is considered to be one of the standard protective paints, many persons thinking it the equal of red lead for this purpose.

BLACK PAINTS.

There are many forms of black paint pigments, all of them practically pure carbon, though they differ in structure and qualities. The one most commonly used in the navy is lamp-black, which is made by the combustion of oils. It has remarkable tinting strength and the outside paint now used on ships owes its slate color to the addition of lamp-black, the base being of practically the same constituents as the white paint used formerly.

There are a number of graphite pigments, all of them being nearly pure carbon; alone they form an unsatisfactory paint pigment, but added to other heavier bases graphite pigments have great merit.

RED PAINTS.

For many years quantities of English vermilion paint were used on naval vessels for painting the inside of ventilator cowls. There is no doubt that this added considerably to the smart appearance of the ships in contrast to the white hulls and salmon-colored top sides.

English vermilion is a sulphide of mercury and has the defect of hardening when mixed with oil and kept. The purchase of English vermilion for the navy was abandoned a number of years ago, in line with commercial practice, in favor of the so-called artificial vermilion. This is cheaper, less likely to change color and can be kept mixed ready for use. The particular pigment used in the navy is a lead-barium lake of the azo dye, known commercially as "Lithol."

Red, as well as green, yellow and blue paints, do not have the same importance in the navy as was the case formerly, due to the adoption of the slate color for exteriors of ships. Their use is confined almost exclusively to painting the distinguishing striping on piping on board ships.

BITUMASTIC PAINTS.

Specifications for recent battleships require that the builders, in lieu of the red lead and other paints usually required for these localities, shall apply to coal bunkers, trimming tanks, reserve feed water tanks, inner bottoms in machinery spaces, and bulkheads and foundations in machinery spaces to height of floor plates, the so-called bitumastic paints or their equivalents. These materials are supplied by several firms under different names, and

of them being of similar composition and characteristics. A discussion of them seems proper, as they promise to play an important part in future painting of the spaces mentioned above, which in the past on naval vessels have been a source of considerable worry to the officer responsible for their up-keep. Coal-tar products deteriorate when exposed to light and for that reason these materials can be applied only in confined spaces. Formulas are given for their manufacture which have been determined tentatively and, while they should not be regarded as final, they will serve to indicate the character and general ingredients of the materials.

The first coat to be applied in all cases is the so-called "solution," which may be made by melting 100 lbs. of coal-tar pitch and 50 lbs. of Trinidad asphalt. When liquid the mixture is removed from the fire and cooled and thinners added consisting of 65 lbs. of coal-tar naphtha and 15 lbs. of mineral oil.

The "enamel" may be made by melting 350 lbs. of coal-tar pitch and 350 lbs. of Trinidad asphalt together and boiling for about three hours.

The "cement" may be made by melting 150 lbs. of coal-tar pitch and 120 lbs. of Trinidad asphalt together and boiling for about three hours, when 150 lbs. of Portland cement is added and stirred in.

In all of these care is required in the heating, the quality of the material is dependent entirely on the manner in which this is accomplished.

The "solution" is applied first in all cases and does not require to be heated, but is brushed on cold. In some spaces the other materials are unnecessary, though it is best generally to follow up the solution with the enamel or cement, both of which must be heated to apply. The former goes on in thickness of about 1/16", the latter about ½". The cement is applied only to the bilges in the machinery spaces, and in the firerooms frequently it is protected by a covering of Portland cement.

These materials have been tried to a limited extent on naval vessels, but have been used extensively on merchant ships for many years. The author inspected, in 1904, the American Line *St. Louis*, which had had the bitumastic materials applied at the time of building in 1894-1895 to trimming tanks, chain lockers, double bottoms, coal bunkers and inner bottoms. The original material was in good condition and had received only minor

repairs. The metal underneath generally showed no signs of corrosion and in many cases the hammer marks around rivet heads could be seen when the bitumastic was removed.

THE SO-CALLED "INERT FILLERS."

For many years white lead, white zinc, linseed oil and turpentine have been regarded as the standard ingredients of which any paint should be made. Many manufacturers quietly utilized other materials that gave results quite as good, but the consuming public cared mainly about the results and had no means of determining the ingredients. A general tendency grew up to regard as adulterants many other pigments than the above that have excellent qualities to recommend them as paint ingredients. Among these may be mentioned lithopone, blanc fixe, barytes, whiting, gypsum, china clay and silica. Some years ago a number of states passed the " pure paint laws " that required, in effect, labelling packages of paint with a statement of the contents. This precipitated the situation, in which many manufactures find themselves, of being forced to justify their use of materials that have given satisfactory results, but which they have used unheralded and which they have permitted the public to be taught to consider as adulterants. An effective campaign now is being waged to show that all of these materials have their function when used in the proper proportions in paints, though their unskilled use perhaps may not give as satisfactory results as older and better known pigments. It was demonstrated by actual exposure tests at the seashore that paint in which the much-despised barytes was a principal pigment gave as good results as one made up with only white lead and white zinc. Many of the numerous kinds of paints used by the agricultural implement trade are made largely from barytes and the results obtained from these should be a sufficient lesson to the navy that its paint money could be spent to better advantage than in the exclusive purchase of lead and zinc paints.

Lithopone is a remarkably fine white pigment consisting of about 70% of barium sulphate and 30% of zinc sulphide. It has achieved great vogue recently for use in the flat wall finishes which promise to supplant wall paper to a large extent, due to their sanitary properties and durability. It is not suitable, however, for outside paint.

Blanc fixe is barium sulphate artificially produced and is superior to barytes in its fineness and texture. It has many qualities t

recommend it for naval purposes and experiments looking to its use have been undertaken, with excellent practical results. Slate-color paint for outside of ships made according to the following formula has given excellent results in preliminary tests:

450	lbs. blanc fixe, dry.
70	lbs. French ochre, dry.
467	lbs. white zinc, dry.
93	lbs. graphite in oil.
3	lbs. lamp black in oil.
93	gal. raw linseed oil.
12	gal. oil drier.
8¾	gal. turpentine substitute.
2	gal. benzine.

Barytes is well known as the white mineral barium sulphate. Used alone it has little covering power, but when mixed with white zinz or white lead it gives excellent results. Consideration shows that it would not be unreasonable to expect it to show durability as a paint pigment, as it is one of the most permanent of the minerals and is absolutely insoluble in most solvents. Due to its density and crystalline structure, barytes has not large covering or hiding power, and needs to be mixed with other pigments to form satisfactory paint.

Whiting, or calcium carbonate, is used mainly for making putty, but small percentages are used by many manufacturers in all paints for the purpose of neutralizing any acidity that may develop. This feature of whiting recommends it highly for paints for steel surfaces.

Gypsum, or calcium sulphate, is the main ingredient of venetian red, of which large quantities are used by the navy; the remainder being ferric oxide. In its pure state it is used to advantage if free from lime.

China clay is used mainly as a filler for paper, but has considerable value in paint mixtures, its addition being an improvement to red-lead paint as seen above.

Silica is useful in mixing with other pigments, largely because of its quality of presenting an excellent surface for repainting. This quality alone should recommend it for use in many of the paints used on ship-board, and the statement has been made that the time is not far distant when all good mixed paints will contain silica.

Asbestine is a silicate of magnesium, and is fibrous in character. It is extremely stable and when used in mixed paints has a ten-

dency to hold up the heavier pigments and to keep them from settling to the bottom of the container. It is used considerably in ready-mixed paints for this reason.

VARNISHES.

Varnishes are made ordinarily by melting the gums or resins, then adding hot linseed oil and, when the mixture has cooled sufficiently, thinning with turpentine or petroleum spirits. The varnishes intended for outside use, usually known as "spar varnishes," are made with better and harder gums and do not contain so much volatile solvent and consequently dry more slowly. Varnishes for interior use are usually not so expensive, have more volatile solvent and dry much more rapidly even in confined spaces.

Considerable skill is required in the manufacture of varnish and the results vary considerably between the products of different makers, even when the same materials have been used. Some makers, by the use of lower-grade gums and even common pine rosin, can produce better varnishes than their competitors can with the best materials. The only test of varnish that can be relied on is a service test, which, however, is prohibited by the length of time required before the varnish will wear out. It is, therefore, necessary to purchase varnish on specifications which require a chemical test only, and, though this cannot be regarded as showing conclusively the quality of a varnish, it is fair generally to assume that varnishes in which only the best materials have been used are of good quality and will give satisfactory results.

Damar varnish, which is made from damar gum and turpentine, without the use of oil, is used in mixing enamel paints for interiors of living spaces on ship-board. It was selected for this purpose due to its light color, although it is not so durable as the linseed-oil varnishes. With a slight sacrifice of whiteness, a gloss paint could be made by using an oil varnish that would be much more durable than damar varnish paint and cost no more. The flat-wall finishes made from lithopone that have become popular recently contain a small percentage of varnish and for that reason will stand scrubbing quite as well as gloss paint made with damar varnish.

Asphaltum varnish is made in the same way as other oil varnishes by using a fossil asphalt, known as gilsonite, with linseed oil and a solvent. This kind of varnish has not very great durability.

Varnish gums or resins are fossil remains of exudations from trees and there are many varieties and grades. The older gums are harder, amber being the final result of aging. Varnish has been made with amber, but, due to the extreme heat necessary to melt it, the resulting varnish was dark colored and had no particular merit.

SPECIAL RUST-PREVENTING PAINTS.

The subject of corrosion of steel has received of late years considerable attention commercially, due to the amount of money being invested in buildings which depend for their existence upon the integrity of their steel structures. This steel is not subjected to the trying conditions that a sea-going ship experiences, for the reason that it is imbedded usually in cement concrete, and, moreover, is not exposed to salt water or air laden with salt moisture.

As a result of these efforts there have been developed a number of paints designed especially to prevent rusting of steel surfaces. While it would not be possible to discuss all of the different kinds and characters of these paints, it is believed that description of several of them, that have been used successfully to some extent in the navy, will be of interest in showing the possibilities and the breadth of the field.

A paint that has been used extensively in steel work of recent buildings contains as a pigment a mixture of oxides of silica, calcium and aluminum, resembling closely Portland cement, which is mixed with other materials and china wood oil. The latter has the property of forming a moisture-excluding film, while the cement absorbs, when applied, moisture that may be present on the surface and permits the use of such a paint on moist surfaces. These latter characteristics are sufficient to justify the substitution of such a paint for many localities in which red lead now is used. Its price, which is one-third less than that of red lead, and its protective and rust-preventing qualities, which have been shown by experiment to equal if not surpass red lead, are added reasons in favor of the adoption of such a paint for naval vessels.

A paint that has given excellent results when used on the interiors of trimming tanks of submarines is made with a graphite pigment and an asphaltic oil thinned with benzine. This paint has displayed remarkable protective qualities when used under the trying conditions mentioned above and its cost is less than one dollar a gallon. Red lead, which costs not far from two dollars

THE FUNDAMENTALS OF NAVAL TACTICS.

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PART II.

MANEUVERING.

CHAPTER I.

IDEAS ON NAVAL KINEMATICS.

29. *Preliminaries.*—The motive that induces us to cite a few fundamental ideas on naval kinematics must not be sought for in a desire for mathematical divagations, nor for the study of battle maneuvers on the basis of aprioristic hypotheses concerning the movements of the enemy. The object that we propose for ourselves is that of determining criteria of the maximum simplicity, holding it to be an axiom that, in offensive contact, it is absurd to place confidence in tables, diagrams, or instruments for geometrical constructions. Furthermore, it is well to give notice that, while not excluding such means in contact out of range, and during exercises (and in the latter only until a sufficient habit in maneuvering is acquired), the only one of them that we deem indispensable for the conning of a ship under the fire of the enemy, is that composed of a horizontal disc upon which are marked the sectors of offense of the weapons, and in the center of which is a revolving alidade furnished with a sight vane.

But precisely in order to be free from all shackles, clearness of ideas is necessary concerning the solution of the principal problems of kinematics, and toward this we shall tend, limiting ourselves to the purely indispensable.

To fix the idea, let us refer to the case of two ships opposed to each other, observing that, on the basis of the deductions of Chapters I and IV of Part I, we cannot confine ourselves to considering the rectilinear tracks.

Indeed, in long-range battle, if we suppose that our ship is in the proper tactical zone, that the enemy bears approximately in a direction of maximum utilization, and that we maintain a constant course, after a short time—except in very particular cases—the inclination to the plane of fire could not be held to

answer to the tactical necessities; and hence it will be necessary to follow a new course.

In general, rather than change the course at intervals, and so disturb the fire control, there naturally comes the idea of satisfying the tactical necessities continuously rather than intermittently, by keeping the polar bearing of the enemy constant *for a certain time,* which can easily be done by means of the alidade of the instrument just mentioned. In this way, the track passed over is generally curvilinear; and its curvature is naturally a function of the enemy's track. As—steering thus by means of the sight vane—the ship continually changes her course, the doubt may arise that the disturbance of the firing may be continuous; we establish, then, the idea of taking also into consideration these curvilinear tracks, unless upon examination their radii of curvature prove to be very great. It is clear that if such conditions are realized, they present a real advantage by substituting continuous, but very slow, changes of course for those of notable amplitude between the successive courses of a broken right line.

Setting aside the effect upon the firing, it is intuitively seen that steering on a constant bearing may be advisable under some circumstances, because it permits the maximum simplicity of maneuvering that can conveniently be adapted in a continuous manner to the maneuvering of the enemy.

When the advisability of the continuous adaptation just now mentioned does not exist, and the problem is that of taking, with the greatest rapidity, a determined position with respect to a ship or a fleet of ships, the necessity of rectilinear tracks is evident. In fact, they permit of attaining the desired object in the minimum time, unless a curvilinear track may be convenient in order to diminish the uncertainties of the maneuver, and may permit of reaching the desired position in a space of time only slightly greater than the minimum.

In general, then, we may establish the necessity of rectilinear tracks:

(a) In contact out of range.

(b) In the maneuver of approach of a light, swift vessel.

(c) In the movements of friendly ships (evolutionary problems).

Bearing in mind what has previously been said, for the study of the movements of two ships—which forms the object of this

hapter—we are to consider rectilinear movements and those on constant bearing.

30. *Indicator of Movement* (Fig. 12).—Let us consider the multaneous positions of two ships, *A* and *B*, of which V_A and V_B are the respective speeds, and AA_1 and BB_1, the courses. If A_1 and B_1 are the simultaneous positions of said ships after an nfinitesimal time *dt*, let us take A_1A_1' parallel and equal to BB_1, ut in a contrary direction. The distance $A_1'B$ is equal to that of A_1B_1; moreover, the joining lines A_1B_1 and $A_1'B$ form the same ngles with the courses of *B* and *A*. The geometrical locus of he points A_1' (of which *A* is the origin) is the trajectory or indi-ator of the relative movement of *A* with respect to *B*, called,

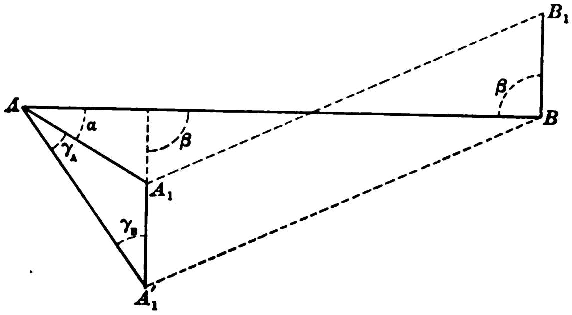

FIG. 12.

briefly, the *indicator of movement;* or, in other words, it is the track that the ship *A*, at a speed which is the resultant of V_A and V_B (the relative speed), passes over with respect to the ship B, which is supposed to be stationary.

31. *Generalities Concerning Rectilinear Movements* (Fig. 12).—If the tracks of *A* and *B* are rectilinear and the speeds V_A and V_B are constant, the indicator of movement will be rectilinear. In fact, from what has been said, the points of A_1' are aligned with *A*, the resultant of the speeds being also constant.

Consequently, if *A* must determine the proper course for bringing itself into a given position with respect to *B*, it is well to observe that the course that corresponds to the hypothesis of an immovable *B* is the indicator of movement; the problem is then reduced to that of passing from the indicator of movement to the course of *A*.

mentioned relation. It is easily seen, concerning the aforesaid geometrical construction, that when $V_A = V_B$, a relative speed, O, corresponds to one of the said values of y_A; if $V_A < V_B$, the relative speeds corresponding to the two values of y_A are made in the same direction; and this must be taken into account in order to select the proper value of y_A, since both the values of y_A bring one to the desired position, but in different times; finally, if $V_A > V_B$, the two values of the relative speed have contrary signs.

32. *Chase Problems.*—The simplest application of the preceding deductions consists in *determining the proper course for overtaking another ship.*

In this case, the indicator of movement is the joining line AB; therefore, during the movement, the two ships keep each other on the same polar bearings. The course sought can be determined with the geometrical construction, already mentioned, which it is superfluous to recall as it is practically done with an instrument having two alidades. The immediate determination of the proper course would require exact knowledge of the course and speed of the other ship; this not being presumable, recourse must be had to successive rectifications.

When there is no instrument available except one with a single alidade—mentioned in Section 29—the course to be steered must be estimated by eye and afterwards corrected until the polar bearing remains constant. In this way the ship A which gives chase generally follows a broken rectilinear track; we shall presently see how the rectifications just mentioned may be limited.

Conformably to observation 3 of the preceding section, the condition that the course steered should keep the polar bearing constant is necessary, but it is not sufficient to bring about a meeting; in fact, this may be verified for two courses of A which form supplementary angles with AB. When $V_A < V_B$ the meeting is not possible if B holds A on a polar bearing, from the bow, greater than that of which the sine is $\frac{V_A}{V_B}$. Both the above-mentioned courses may lead to a meeting, but naturally the one which makes the greater angle with the said joining line *cannot secure the object in the shorter time;* and the existence of such a solution is worth remembering in practice in order to avoid errors. In the case of $V_A = V_B$, the course that makes the greater angle with the joining

line and keeps the polar bearing constant, is parallel to the course of B; or, geometrically, it would lead to a meeting in an infinite time. Finally, when $V_A > V$, the course of A, which makes the greater angle, diverges from the course of B, and the ships may be considered as departing simultaneously from the point of intersection of the courses.

This being said, we observe that if A steers on a constant polar bearing equal or nearly equal to the one necessary for reaching a meeting in the shortest time, the indicator of movement is rectilinear, or it is very nearly a straight line; and hence A arrives at the meeting in the minimum time, or in a time slightly greater. It is unnecessary, then, to establish the precise condition that the

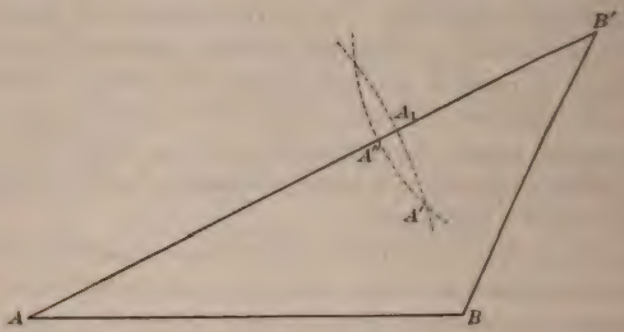

FIG. 13.

track of A be rectilinear; and this suggests the practical rule of not troubling oneself too much about the aforesaid rectifications of the course, *but determining an approximate course, and then steering so as to keep constant the polar bearing thus obtained.*

II. The problem just discussed is a particular case of the following: *To determine the course that a ship, A, must steer, with a speed V_A, in order to arrive, in the minimum time, from a distance R to a distance r from a ship, B, which steers a rectilinear course at a speed V_B; in case this is impossible, to determine the direction in which A must move in order to reach the minimum distance from B.*

In order to solve this problem, let us first of all demonstrate that if A' and B' are the positions of A and B when A has reached the distance r from B in the minimum time, the three points A,

A' and B' are in a straight line. This may easily be demonstrated by an absurdity.

Let us suppose $R>r$. Let us also suppose that A' is not upon the joining line AB' (Fig. 13) and that A_1 is the point of intersection of AB' with the circumference whose center is at A and whose radius is AA'.

Let A'' be the point of intersection of AB' with the circumference whose center is at B' and whose radius is $B'A'=r$. It is clear that AA'' is less than AA_1; if, then, the ship A had followed the course AB' it would have arrived at a distance from B less than r, in a time equal to that occupied in passing over AA'. Into such absurdity one always falls, except in the case in which A' is on the joining line AB'; the alignment mentioned is therefore necessary. The proposition enunciated is analogously demonstrated if $R<r$; that is to say, if, instead of diminishing the distance, A must increase it. From this it follows that when A arrives at a distance r from B, if this is accomplished in the minimum time, B must be found exactly ahead of him if $r<R$, or exactly astern of him if $r>R$.

If the ship A, which sees B pass ahead of it at the distance r, should continue on its course, it would evidently cross the track of B after a time $\frac{r}{V_A}$, in which time B would have passed over a space $r\frac{V_B}{V_A}$. It follows from this that, in order to execute the maneuver of approach from any distance, R, to a distance r, in the minimum time, it is not necessary to steer as if one wished to reach the ship, as was pointed out in Problem I, but *to maneuver in order to reach an imaginary point which is situated astern of B at the distance* $r\frac{V_B}{V_A}$, *and which moves with the speed and on the course of B.*

Evidently, the greater the distance r, and the smaller the advantage in speed that A has over B, the more important it is to bear in mind the difference between the exact solution—which results from the consideration just alluded to—and the approximate solution which corresponds to the hypothesis $r=0$, or to the other hypothesis $\frac{V_B}{V_A}=0$.

In contact out of range, in which there is a possibility of mak- ing a geometrical construction, the course sought is determin by laying off AB (Fig. 14), which may represent R, then tak a segment, $BH = r\frac{V_B}{V_A}$, in a direction parallel and opposite to course of B, and finally forming (Section 31) the triangle AA_1A_1' in which A_1A_1' is parallel to BH, and wherein the ratio betw the sides AA_1 and A_1A_1' is $\frac{V_A}{V_B}$. The solution may be obtai more simply by describing the arc of a circle with its center at and with a radius r, cutting AH at a point H'; which indicat the course $H'B$ that A must follow, and in regard to which the general discussion of Section 31 is recalled to mind.

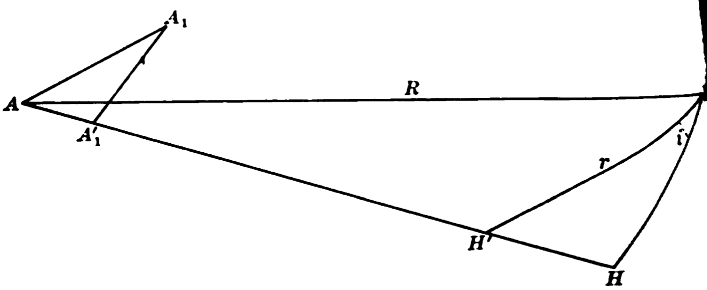

FIG. 14.

When A and B are in sight of each other the reason for apply- ing the approximate solution in the manner indicated under Prob- lem I, is that one cannot steer by sight vane for the point because that point is not distinguishable. Nevertheless it do not seem that the exact solution may be completely neglect since we are able to come near to it, without any complication, observing the following rule: *Maneuver initially as if it we desired to come to a meeting with B, and then, successively, intervals, bring the sight vane by which we are steering toward more toward the bow, in such fashion that the said ship may bearing ahead when the desired distance is reached.*

If $V_A < V_B$, so much the more necessary is it to refer to general problem, inasmuch as the problem of meeting may be impossible one; but we may approach to the minimum dist therefrom, which, as is seen in Fig. 14, is evidently that for $H'B$ (and hence the course of A) is perpendicular to the

cator of movement. In order to reach this minimum distance, the cosine of the angle i between the courses must equal $\frac{V_A}{V_B}$.

In contact out of range it is possible that it may be foreseen that the enemy will follow a broken rectilinear track when in the vicinity of the coast.

If the track of B (Fig. 15) is BB_1X, two cases may present themselves: 1st, A may arrive at the desired distance r from B, before B arrives at B_1; and then the solution is the one already

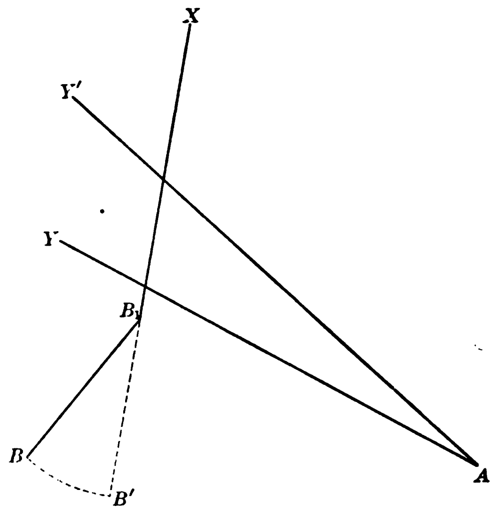

FIG. 15.

indicated. 2d, the course AY, along which A would have to move under the preceding hypothesis, intersects BB_1X in some point of B_1X. From B_1, then, we lay off on the prolongation of B_1X the segment $B_1B' = B_1B$. It is evident that the direction AY', in which A must move in order to solve the problem, is obtained by supposing that the movement of B always takes place along B_1X, and that B' is the initial position of B. Clearly, this course of reasoning might be extended to the case in which the broken rectilinear track has more than two segments.

When $r > R$, the solution of the problem enunciated is obtained in a way analogous to that required for $r < R$, observing that the course on which A reaches the distance r in the shortest time,

cuts the line of the course of B ahead of that ship, and a
tance $r\frac{V_B}{V_A}$; hence, unless A is exactly astern of B, th
opportune course for increasing the distance up to a cert
as rapidly as possible, must be a diverging one.

33. *Evolutionary Problems.*—I. Let us suppose that
16) follows the course BX at a constant speed. If A fin

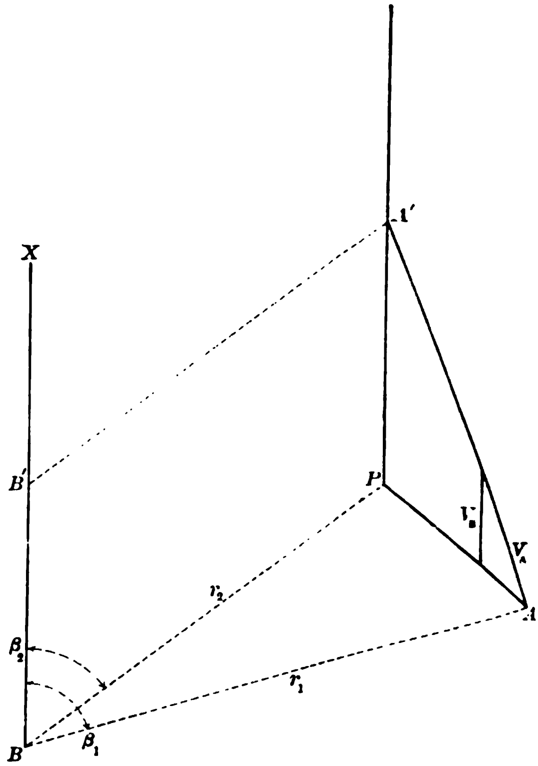

FIG. 16.

with respect to that ship, at a distance r_1 and on the pola
ing β_1, and desires to pass in the minimum time to the dist
and to the polar bearing β_2—that is to say, to a position
respect to B, which is supposed to be stationary—the line
the indicator of movement; and hence, with reference to
has been set forth in Section 31—setting aside the displac
due to changes of course, we may determine the course A
A must follow, and the necessary time.

The problem thus set forth is the one that presents itself when we aim at transporting ourselves from contact out of range, not only to a certain distance from the enemy, but also to a determined relative position.*

Moreover, what has just been said includes generically the cases realized in evolutions that are not performed in succession. If $\beta_1=\beta_2$, AB is the indicator of movement, and the evolution reduces itself to a change of distance; if $r_1=r_2$, the evolution consists of a change of bearing; the indicator of movement is then normal to the bisector of the angle PBA; that is to say,

$$PAB=90^\circ-\frac{\omega}{2},$$

ω being equal to $\beta_1-\beta_2$.

II. Let us now consider the changes of bearing.

The perpendicular segment dropped from B upon AP—that is to say, $AB\cos\frac{\omega}{2}$ —indicates the minimum distance at which the ships will pass during the evolution; it is generally held that the distance ought not to fall below 7/10 of the normal distance, which establishes for ω the limit of 90°.

It is easy to find the formula which permits of obtaining the angle δ through which A must change course, supposing, naturally, that in the position A, the said ship has a course parallel to that of B. From the figure we get

$$\delta=180^\circ-\beta_1-PAB-y_A,$$

in which

$$PAB=90^\circ-\frac{\omega}{2},$$

and y_A is given by equation (2) of Section 31; that is,

$$y_A=\text{arc sin}\left(\frac{V_B}{V_A}\sin y_B\right).$$

Then, since

$$\sin y_B=\sin(180^\circ-\beta_1-PAB)=\cos\left(\beta_1-\frac{\omega}{2}\right),$$

e obtain

$$\delta=90^\circ+\frac{\omega}{2}-\beta_1-\text{arc sin}\left[\frac{V_B}{V_A}\cos\left(\beta_1-\frac{\omega}{2}\right)\right]. \qquad (3)$$

* If the movement of B, instead of being on a single course, can be pre-icted to follow a broken rectilinear track, the method to be followed is ridently analogous to that indicated in the preceding section. (Author's

The change of course must be made toward B, or in the opposite direction, according as δ is positive or negative.

In order to be able to pick out the value of δ from a table, the latter might be one with two entries (that is, $\beta_1 - \frac{\omega}{2}$ and the ratio of the speeds).

In order to eliminate the use of tables, recourse should be had to diagrams,* to an instrument with an alidade, or to the method by parallel courses, making the ships change course through the angle $90° + \frac{\omega}{2} - \beta_1$ in a way that may result in the direction AP, B afterwards executing the reduction of speed. With this latter method the relative speed is $V_A - V_B$; and hence the time necessary for the evolution remains at that corresponding to the method above indicated (AP being always the same) in the ratio $\frac{V_r}{V_A - V_B}$, by virtue of equation (1) of Section 31. Hence it is evident that the evolution by the method of parallel courses can never occupy less time than that which is required by the other method, which we will call *the method by oblique courses.*

A general rule—which we shall suppose to be implicitly followed in the evolutions when nothing is specified to the contrary—is that the ship B at the beginning of the evolution (or before reducing the speed) makes the two changes of course (initial and final) that A makes at A and at A': with this rule, mentioned by Admiral de Gueydon,† the displacements due to changes of course are rendered the same for A and for B.

III. *Definitions.*—If two ships have the same course and speed, and the one further advanced in the direction of the course is bearing from the other at an angle α from the bow, we say that it is on the *line of polar bearing* α.

By *wheeling a line of polar bearing* we mean the evolution by oblique courses which permits of rotating the line joining the two ships, at the end of which rotation the former polar bearing of the formation is re-established.

* PESCI: Sui metodi per cambiare il rilevamento fra le navi di una formazione semplice, *Rivista Marittima*, March, 1897.

† Tactique Navale. Recherche des principes primordiaux et fondamentaux de toute tactique navale (1868).

'ig. 17 shows a line of bearing that executes a wheel through amplitude ω. The ship B—which is the one situated on the : toward which the wheel is to be executed—changes to the rse BI', which makes with the original course BI the angle n the direction of the wheel; after this B reduces the speed, uming a speed V_B, while A maintains the evolutionary speed, ich we will designate by V_A. In order that the distance at the l of the evolution may be the normal distance, the indicator of vement must be AP, such that $PAB = 90° - \frac{\omega}{2}$; so that the rse that A must follow is AA'. When A has nearly arrived at

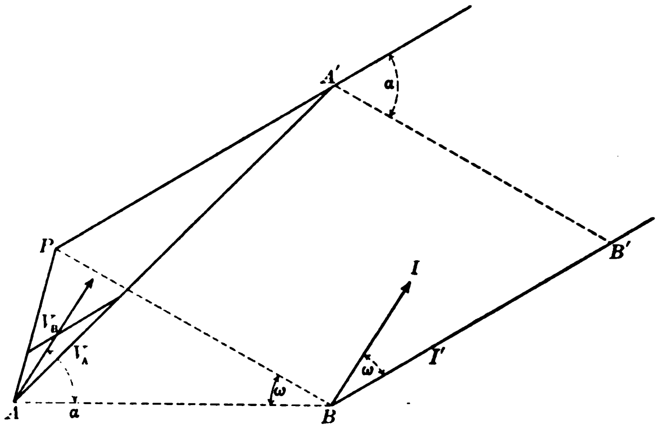

FIG. 17.

position A', it changes to a course parallel to BI', while B in takes up the normal speed.

Evidently this problem is but a particular case of the one before sented, and, in its turn, the problem of wheeling a column of sels is a particular case of this one. In such particular case the ice of the pivot ship is optional; that is, the line may be made wheel about the rear ship or about the leading ship.

n 1905 we were led to consider the wheeling of a column of sels by reading an important article entitled, *Notes on the nciples of Naval Tactics,* which appeared in the September nber for that year of the *United Service Magazine*, signed by pseudonym *Experience*. In the said article mention is made

V. By equation (1) of Section 31, the time necessary for cuting a change of bearing (or a wheel) of an amplitude ω, is

$$t=\frac{AP}{V_r}=\frac{2AB\sin\frac{\omega}{2}}{V_r}, \qquad (6)$$

m which it is seen that *the duration of the evolution is propor-tal to the length AB of the line or column.**

Let us now compare the rapidity of wheeling a column of vessels the two methods indicated.

Let B be the pivot ship (Fig. 18). According as the ship A is A_2 or at A_1—that is to say, ahead or astern of the pivot—in ler to wheel the line through ω, we find ourselves in the case pivoting on the rear or on the head.

A_2' and A_1' being the corresponding positions of A at the end the evolution, let us determine what must be the ratio $\frac{A_1B}{A_2B}$, the end that we may have $A_2A_2'=A_1A_1'$. By virtue of the portionality before mentioned, this ratio indicates the relative idity of the two methods, which we will indicate by $\frac{t_2}{t_1}$, and t_1 being the times respectively employed in the case of oting on the rear and on the head.

Considering the triangles A_1BA_1', A_2BA_2', by equation (5), have

$$A_2A_2'B=\phi_t; \quad X_1A_1'B=\phi_c;$$

1 hence

$$\frac{\sin\phi_t}{A_2B}=\frac{\sin\omega}{A_2A_2'}; \quad \frac{\sin\phi_c}{A_1B}=\frac{\sin\omega}{A_1A_1'}.$$

The ratio between the times necessary for the evolution by the method parallel courses and by that of changing direction in succession is

$$\frac{2\sin\frac{\omega}{2}}{V_A-V_B}V_A,$$

the first of these methods is more rapid if

$$\sin\frac{\omega}{2}\leq\frac{1-\frac{V_B}{V_A}}{2}.$$

ith this formula, for $\frac{V_B}{V_A}=\frac{1}{2}$, $\omega\leq 29°$; for $\frac{V_B}{V_A}=\frac{8}{10}$, $\omega\leq 12°$.

en, from what has been said in division II, the evolution by oblique rses is proper in limits wider than these. (Author's note.)

from which—as, by hypothesis, $A_2A_2'=A_1A_1'$—we obtain

$$\frac{A_1B}{A_2B}=\frac{\sin\phi_c}{\sin\phi_t}.$$

Calculating ϕ_c and ϕ_t by means of equations (4) and (5), deduce from this formula the values of the ratio $\frac{A_1B}{A_2B}$, wh

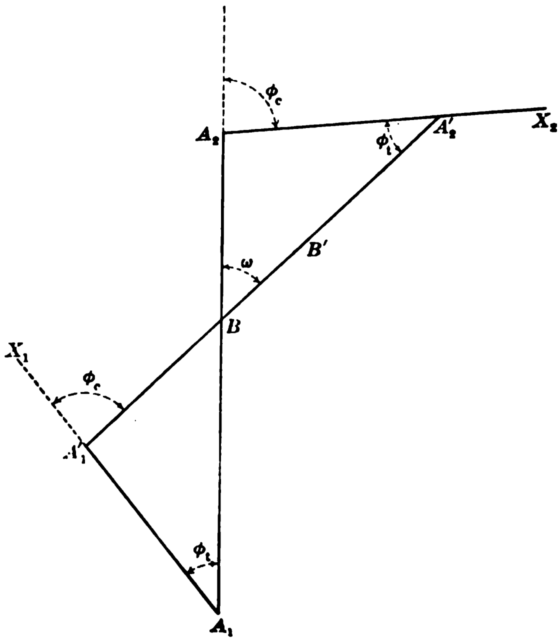

FIG. 18.

values, set down here below opposite ω, are determined under hypothesis that $\frac{V_B}{V_A}=\frac{1}{2}$.

ω	$\frac{t_2}{t_1}$
15°	1.16
30°	1.35
45°	1.57
60°	1.78
75°	2.00
90°	2.24

It results from this table that the greater rapidity is obtained by pivoting on the head; by the other method, for the supposed speed ratio, about double the time is employed if ω is between 60° and 90°, and one and a half times more if ω is between 30° and 45°.*

Let us now consider the time required for changing the direction of the line through the angle ω by changing course in succession, and compare it with that required by a wheel with a pivot at the head; setting aside the time employed in changes of course.

Indicating by t_0 the time required for the change of direction by changing course in succession, we have

$$t_0 = \frac{AB}{V_A}, \tag{7}$$

while the time required for the wheel is given by equation (6); hence

$$\frac{t_1}{t_0} = \frac{2 V_A \sin \frac{\omega}{2}}{V_r}.$$

In the case we are considering (pivoting on the head), in the formula of Section 31, which gives V_r, it is necessary to put

$$\alpha = \phi_t; \quad \beta = 180° - \omega;$$

and by equation (5) we obtain

$$\alpha - \beta = \phi_c - 180°;$$

therefore we have

$$V_r = V_A \sqrt{1 + \left(\frac{V_B}{V_A}\right)^2 - 2\frac{V_B}{V_A}\cos\phi_c}.$$

There results, then,

$$\frac{t_1}{t_0} = \frac{2 \sin \frac{\omega}{2}}{\sqrt{1 + \left(\frac{V_B}{V_A}\right)^2 - 2\frac{V_B}{V_A}\cos\phi_c}}.$$

* It is easily seen that $\frac{t_2}{t_1}$ increases the more $\frac{V_B}{V_A}$ approximates to unity. It is well to note that, in any evolution, we may not adopt in practice a ratio $\frac{V_B}{V_A}$ less than ½; indeed it must be remembered that the speed of the pivot ship is not instantaneously reduced, and hence, in order to have the mean speed V_B during the evolution, the engine must be regulated for a lower speed. (Author's note.)

With this formula, for $\frac{V_B}{V_A} = \frac{1}{2}$, there are calculated the values of $\frac{t_1}{t_0}$ set down in the following table, in which are also written the values of $\frac{t_2}{t_0}$ obtained by multiplying the values of $\frac{t_1}{t_0}$ by the corresponding values of $\frac{t_2}{t_1}$ given in the preceding table.

ω	$\frac{t_1}{t_0}$	$\frac{t_2}{t_0}$
15°	0.28	0.32
30°	0.51	0.69
45°	0.71	1.11
60°	0.86	1.53
75°	0.99	1.98
90°	1.09	2.44

Having regard to the rapidity and to the simplicity of the evolution, and reserving it to ourselves to discuss the subject in relation to the movements of the enemy, this table permits us to announce the following conclusions:

1st. *When ω is greater than 30°, a change of course in succession is preferable to a wheel on the rear ship.*

2d. *A wheel on the leading ship may be preferred to a change of course in succession when ω is within the limit of 60°.*

Within the limits thus established, indicating by t a value of t_1 or of t_2, and t_0 being the corresponding value given by equation (7), putting $\frac{t}{t_0} = m$, we have

$$t_0 - t = \frac{AB}{V_A}(1 - m).$$

The gain in time permitted by a wheel is then directly proportional to the length of the line.

34. *Determination of the Course and of the Speed of the Enemy.*—I. The principal force (or the main body of the fleet), on information from the units that keep the enemy in sight and determine his course and speed with the closest approximation possible, can execute the maneuver of approach in the way indicated in Sections 32, II, and 33, I.

The preliminary problem reduces itself to the hypothesis of a ship, A, that wishes to determine the course and the speed of another ship, B.

With this object in view, the ship A keeps on a constant course

and, at any interval, t, of some minutes, it repeats the measurement of the distance and the polar bearing on which B lies. Drawing the triangle $AA_1' B$ (Fig. 12), wherein AB and $A_1'B$ represent two measured distances, and the angle at B is the difference between the corresponding bearings, the line AA_1' is the indicator of movement; consequently, marking on the drawing the course of A and taking on it the segment AA_1, equal to the distance passed over by the ship in the time t, the segment $A_1'A_1$ will represent, in direction, the course of B, and in length, the distance passed over by the said ship in the said time.

With these measurements, two values for the course as well as for the speed sought may thus be obtained; hence, the mean of these may be taken, and so proceeding, an approximation may be reached which is so much the closer, the greater the number of measurements made.

But we note that, under the circumstances in which the problem must be solved, the distance AB may be predicted to be in the neighborhood of 15,000 meters, and may be even greater; hence but scant confidence can be placed in the accuracy of the indications supplied by the range finders. For this reason it is well to observe that, in the determination of the elements we are seeking, we may proceed with a graphic method, based upon the measured polar bearings and the spaces passed over in the intervals, supposing the distance to be only roughly known.

For this very simple method, devised by Lieutenant P. Corridori, it is expedient: 1st, to follow a course that is not parallel to that of B; 2d, that, considering the surface of the sea to be divided into two parts by the joining line AB, the two courses be *not* directed toward the same side of the line.

This being said, here, in a word, is the method: We mark off on a straight line which represents the track of A (Fig. 19) the points A, A_1, A_2, ... corresponding to the space passed over in the interval established between the successive measurements, and then we draw from these points the straight lines AB, A_1B_1, A_2B_2, ... forming with the above-mentioned line the measured polar bearings.

With a graduated ruler, estimating by eye the direction followed by B with respect to A, we seek, by trials, to find the position that the ruler must assume in order that the segments BB_1, B_1B_2 . . . . may be equal among themselves. Such a position

of the rule is the line of the course of B, and the scale of the drawing supplies his speed.*

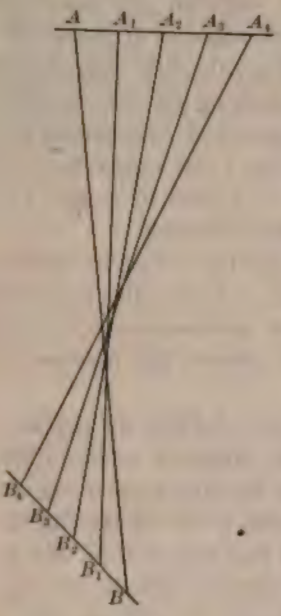

FIG. 19.

Having a fairly good knowledge of the distance, the two methods above indicated may be combined; in other words, AB and A_1B_1 being marked down, taking into account the first two distances measured, we place the ruler in the direction of BB_1. When the next measurement permits of marking down A_2B_2, we determine a more approximate position of the rule, so that BB_1 may be equal to B_1B_2, and so on.

II. When the fighting forces that have to execute the movements corresponding to the preceding sections are in sight of the enemy, it is obvious that they may not delay beginning those movements in order to determine his course and speed; but it is well to take an approximate course, keeping it constant for some minutes, in order to attempt such a determination by the first of the methods just pointed out, and afterwards be governed by the established rules.

* Evidently if the successive joining lines were all to intersect in one and the same point at a distance finite or infinite (parallelism), the position of the rule would be indeterminate. It is to be noted that theoretically this indetermination exists in any case because the curve traced through the intersections of the joining lines AB, A_1B_1, A_2B_2 . . . . . is a parabola; consequently an error in the initial distance AB produces errors in the speed and in the course. However, when the angle between the courses is within opportune limits, the above-mentioned errors are very small, even when the distance is very roughly known; for example, when a distance of about 15,000 meters is estimated with an approximation of ± 2000 meters.

If the polar bearing were exactly measured, for the application of the method, it would suffice to limit the said measurements to three; but on account of the inevitable errors it is well to take at least five or six bearings, well distanced, for example, at intervals of five minutes. Concerning the probability of so doing it is well to bear in mind that in contact out of range, when the naval forces are not in sight of each other, the course and the speed will not be frequently changed. (Author's note.)

35. *Fundamental Tactical Relation.*—In order to establish criteria of practical utility, the study of the offensive contact must be made in the most general form, considering the supposed adversary free at any moment to keep our ship on the bearing that he may deem most advisable.*

The basis for the study of the types of maneuvering that we shall develop in the following chapters must be sought in a general relation that shall bind together the ***elements of movement*** of the two ships; that is to say, the respective speeds, the polar bearings, and the variation of the distance. To such a relation we shall give the name of ***fundamental tactical relation.***

Two ships, A and B, follow any two tracks. At the moment we are considering, they have the respective speeds V_A and V_B and they have each other on the bearings α and β from the bow.

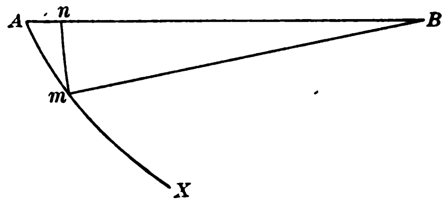

FIG. 20.

The indicator of movement is a curve AX (Fig. 20), of which the tangent at A, which is the direction of the relative speed V_r, forms with AB an angle which we indicate by δ.

If m is a point on the indicator infinitely near to A, describing the arc mn of a circle with its center at B, the triangle Amn may be considered a right triangle, right angled at n; hence

$$An = Am \cos \delta.$$

Letting dr and dt be respectively the differentials of the distance and of the time, since dr is negative when a diminution of the distance is produced, by substituting for An and Am their values, we have

$$dr = -V_r \cos \delta dt.$$

* Suppose, for example, that the enemy follows a constant course, or some other track of geometrically determined form, it is well understood how a proper measure might easily be decided upon; but such a deduction would be of small importance, because it would be based upon too particular a hypothesis. (Author's note.)

Projecting V_r and its components, V_A and V_B, upon AB, as the projection of the resultant is equal to the algebraic sum of the projections of the components, we obtain

$$V_r \cos \delta = V_A \cos \alpha + V_B \cos \beta.$$

Substituting in the preceding equation, there results

$$\frac{d_r}{d_t} = -(V_A \cos \alpha + V_B \cos \beta),$$

which is the relation sought. Putting

$$\theta = 180^\circ - \beta,$$

the fundamental relation may be written

$$\frac{d_r}{d_t} = V_B \cos \theta - V_A \cos \alpha,$$

in which it is to be remembered that θ is counted from the stern and α is counted from the bow.

36. *Constant Bearings.*—If the two ships A and B do not alter their speed, and steer on constant polar bearings, $\frac{d_r}{d}$, or the variation of the distance in the unit of time, also becomes constant, and hence the distance varies proportionally to the time.*

In case the speeds are constant, but the polar bearings are variable, the fundamental relation gives the variation of the distance in a time sufficiently short to enable us to consider α and θ as practically constant during that time. Let us see what may logically be held to be the variability of the elements of movement.

Trusting to our dexterity in firing, we may propose to ourselves to cause the distance to vary rapidly; that is to say, to render $\frac{d}{d}$ the maximum. It is well to observe, however, that we control our polar bearing and our speed; that is to say, only one of the

* It is to be noted that when the speeds and bearings are constant, V_r and δ become constant; the indicator of movement of one ship with respect to the other thus cuts the straight lines drawn from its initial point at a constant angle; it is, then, an equiangular or logarithmic spiral, the pole of which is in the said initial position. The spiral naturally becomes a circle when the distance is kept constant, and is reduced to a straight line when the conditions of movement cause the ships to arrive simultaneously at the point of intersection of their attacks, or when the two ships may be considered as setting out simultaneously from the said point. (Author's note.)

terms of the second member of the fundamental relation. Well and good; by keeping the enemy on a variable polar bearing we shall not be able to oblige him to do likewise, and we shall renounce important benefits. In fact, a constant bearing may opportunely be chosen (Part I, Chapter I); moreover, it facilitates the control and the execution of the firing. The control is advantaged since it must necessarily be based upon the hypothesis that the variation of the distance in the interval between two successive salvos is approximately constant, and certainly the fact that we do not change the gun pointing in direction is good for the execution of the firing.

It is very probable that the enemy also may maneuver well; that is, he may be inspired by the same ideas. In studying the types of maneuvering we shall not exclude the possibility of his withdrawal; but meanwhile *it may be held to be a sufficiently general hypothesis that α and θ do not change for a certain time.* With regard to the speed, it is evidently important to vary it as little as possible.

37. *Curvature of the Ship's Track.*—It is now expedient to ascertain whether the movement on a constant polar bearing may in any case produce sensible disturbance to the firing.

The ship A, when the enemy B has him bearing at an angle θ—to port, for example—produces, by virtue of the fundamental relation, the same variation of distance whether he keeps B bearing at the sight vane angle α to starboard or to port; because, in that way, the values of α to be introduced into the fundamental relation are equal and with contrary signs; that is to say, $\cos \alpha$ does not change. However, according as A keeps B at an angle α, presenting to the fire of the enemy the starboard or the port side, it changes, not only the track of A, but also that of B; although the side that the latter presents may be the same in both cases.

Let us indicate by ρ'_A and ρ'_B the radii of curvature of the tracks of A and B at a given instant, in case the ships present to the fire sides of opposite names; while ρ''_A and ρ''_B indicate the radii in the case in which the ships present sides of the same name.

As, by hypothesis, the bearings are kept constant, the angle through which A and B change course in a given time is the same; and is equal to the angle through which the line joining the adversaries rotates. Let $d\sigma'$ be the said angle for the movement

in the time dt, with sides of opposite names, while we indicate its value in the movement with sides of the same name by $d\sigma''$. Denoting by dS_A and dS_B respectively the differentials of the arcs of the tracks of A and B, there results

$$\left.\begin{array}{l} dS_A = \rho'_A d\sigma' = \rho''_A d\sigma'' = V_A dt \\ dS_B = \rho'_B d\sigma' = \rho''_B d\sigma'' = V_B dt \end{array}\right\}, \tag{8}$$

and hence

$$\frac{\rho'_A}{\rho'_B} = \frac{\rho''_A}{\rho''_B} = \frac{V_A}{V_B}. \tag{8}$$

We may then affirm that, *at any instant, the ratio of the radii of curvature of the tracks is constant and equal to the ratio of the speeds.*

Indicating by ρ' the radius ρ'_A or ρ'_B, and by ρ'' the corresponding ρ''_A and ρ''_B, there results from (8)

$$\frac{\rho'}{\rho''} = \frac{d\sigma''}{d\sigma'}. \tag{9}$$

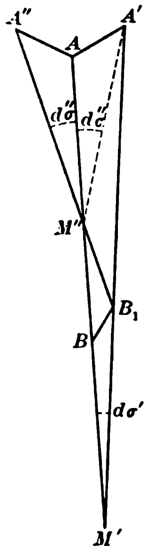

FIG. 21.

This being the case, let B_1 (Fig. 21) be the position of B after the interval of time dt, and let A' and A'' be the corresponding positions at which A arrives according as he selects the movement with the side of opposite name or with the side of the same name.

Prolonging AB and $A'B_1$ to their intersection at M', and calling M'' the point of intersection of AB and $A''B_1$, we have

$$AM'A' = d\sigma', \quad A''M''A = d\sigma'';$$

but since by hypothesis

$$A''AB = A'AB = \alpha,$$

we have also

$$AM''A' = d\sigma''.$$

The angle $d\sigma''$ being thus an exterior angle of the triangle $A'M''M'$, we have

$$d\sigma'' > d\sigma':$$

and hence, by equation (9),

$$\rho'' < \rho'.$$

It is thus established that, *if a ship fights presenting to fire the side of the same name as that of the enemy, the radius of curvature of its track is at any moment less than it would be if, with the same sight-vane angle, the ship should present the side of the contrary name. The rotation of the joining line is more rapid.**

With the object of completely fixing the ideas concerning the subject we are discussing, it is sufficient to have recourse to the relation that gives the value of $\frac{d\sigma}{dt}$, which is determined in a manner analogous to that of the fundamental relation, as follows:

In order to get the angular displacement in the time dt of the line joining the two adversaries, we observe that the length of the arc corresponding to the angle—that is, $rd\sigma$—is equal to the difference of the displacements normal to the joining line in case the sides presented are of opposite names, and to their sum in case the sides presented are of the same name; we have then,

$$\frac{d\sigma}{dt} = \frac{V_A \sin \alpha \mp V_B \sin \theta}{r}, \qquad (10)$$

wherein the negative sign corresponds to σ' and the positive sign to σ''.†

We observe that there results from (8)

$$\rho = \frac{V}{\frac{d\sigma}{dt}},$$

V indicating the speed of the ship A or that of B, and ρ the corresponding radius of curvature. Substituting for $\frac{d\sigma}{dt}$ its value, given by (10), we get

$$\rho = \frac{V}{V_A \sin \alpha \mp V_B \sin \theta} r, \qquad (11)$$

* Evidently we may also reach this deduction when referring to the relative speed. When A and B present to fire sides of the same name, the relative speed is greater than in the other case, and is nearer to the direction normal to the joining line AB. (Author's note.)

† The values of σ' deduced from this relation are positive when the ship A sees the line joining it with the enemy inclined in the direction in which the ship is moving; they are negative in the opposite case, which is realized when

$$V_A \sin \alpha < V_B \sin \theta.$$

(Author's note.)

which confirms the preceding results, and demonstrates further that *the radius of curvature varies proportionally to the distance.* This relation is the one sought and upon which we may base conclusions.

When we say that the changes of course disturb the firing we have reference to the changes with the helm hard over, or with a radius of 400 or 500 meters; this is the limit to which it is necessary to compare the radii of curvature of the tracks.

Referring to the case in which the adversaries present sides of the same name—that is, to the case in which the radii are shorter—it is necessary to establish whether they are great enough not to affect the fire control.

Let us, then, consider the values of ρ'', laying down the observation that, while the values of ρ are different in the case of sides of opposite names and in that of sides of the same name, their ratio, by virtue of (8'), is constant; that is, the relative conditions of the adversaries do not change, and, for the values that the speed ratio may have in practice, these conditions may be held not to differ sensibly.

We will therefore consider the values of ρ''_B, supposing B to be the slower ship; these are given by (10), making therein $V = V_B$, and taking the positive sign in the denominator. Let us refer to a ratio $\frac{V_A}{V_B} = \frac{1}{2}$, and to a single, $r = 500$ meters; because, for the other values of the distance, it is sufficient to take into account the proportionality between ρ and r. Given the ordinary amplitude of the sectors of maximum offense (45° forward of and 45° abaft the beam), we may limit ourselves to varying α and θ between 45° and 90°, because the values of ρ''_B that are realized in the other cases enter into those that are deduced with the preceding data.

VALUES OF ρ''_B (METERS).

$\theta \backslash \alpha$	45°	60°	90°
45°	3210	2860	2620
60°	2910	2620	2420
90°	2700	2450	2270

These values show that, *in long-range battle, the radii of curvature, when steering on a constant bearing, have in any case values so considerable as to exclude disturbance of the firing; rather, the*

ues of ρ'' are such that steering by sight vane may be adopted, n against an enemy who keeps his course unchanged.

n closing the distance the values of ρ'' diminish in a way to .se disturbance to the firing, while the values of ρ' are always y large; in fact, it is enough to bear in mind that the minimum s 5060 meters, which in practice (under the logical hypothesis t B fires with a maximum number of guns) corresponds to 45° and $\alpha = 90°$, for $r = 2500$. *Hence, at close range we may er by sight vane, presenting to fire the side of the name oppo- that of the enemy; when presenting the side of the same ne we must steer rectilinear courses.*

CHAPTER II.

MANEUVERS OF TWO SHIPS OPPOSED TO EACH OTHER.

38. *Importance of the Study of the Naval Duel.*—In this chapter we propose to study the maneuvers of two ships opposed to each other, excluding the case of the attack upon a battleship by a torpedo boat, which will be discussed hereafter.

First of all, it is well to reflect that there is but scant probability of single combats, considering that the more important a ship is, the less rational will be its isolation. Thus, in order to increase the zone explored by a fleet, we might be induced to extend the battleships also in chain, as well as the cruisers. This might seem to be advisable if our ships possessed a speed superior to that of the enemy's similar ships, so as to be able to effect concentration in good time. But such advisability must be excluded, because the conditions under which the meeting with the enemy will take place can never be foreseen. Without need of entering into discussions of a strategic character, as an elementary measure of precaution we may establish the general rule that the battleships should cruise together, and that the armored cruisers should be able to rejoin the main body with facility. Only on account of the material and moral superiority that one has in the pursuit which succeeds a victorious battle, can it be permissible to abandon, at least in part, those precautions that are indispensable in the presence of an enemy in full efficiency.

Duels, then, are to be predicted between the lighter ships; nevertheless, it is not expedient to limit ourselves to examining the hypothesis that may be formulated in this respect. The study of combat between two ships furnished with vertical armor, powerfully armed and protected (battleships or armored cruisers), if it is of improbable practical application, is of importance to us because it serves as a starting point for the study of squadron combat. Indeed, in maneuvering a fleet, the ideal at which it is necessary to aim is that of securing an advantageous position with respect to the enemy, minimizing for each ship the hindrances that derive from its association with the others; or, it is necessary that the maneuvers of each ship, with respect to

that of the enemy upon which it is directing its fire, should approximate, as far as possible, to the maneuvers that it would make if it were alone.

Thus there results the advisability of studying the naval duel in a general way. We shall suppose that the maneuvering is not hampered by the coast or by other causes, and afterwards we shall allude to some special cases.

39. *Distance Kept within Limits and Constant Distance.*—It is clear that the maneuvering of our ships in long-range battle must *generally* satisfy the conditions of keeping the enemy bearing in a sector of maximum offense. Subordinately to this, in whatever way the enemy may maneuver, the maneuvering may be intended either to preserve the distance that one has at the actual moment, or to change it.

Let us now consider the first of these hypotheses. We have recognized (Part I, Chapter IV) the impossibility of assigning a strictly determined value to the distance of maximum utilization; we likewise know (Part I, Chapter I) that the directions of maximum utilization are to be considered as elements of the highest importance for tactical maneuvering. Hence, it would seem logical to establish that the maneuvering should be developed by keeping the enemy in directions of maximum utilization alternately forward of and abaft the beam; in this way the conservation of the distance that is deemed favorable for our ship should be understood in the sense of causing it to vary, keeping its variation, however, within the limits of the zone of maximum utilization. This form of maneuvering, which is called ***maneuvering with limited distance***, cannot be established in an absolute way. In fact, it evidently leads to changes of course that disturb the firing when one passes from the bearing forward of the beam to that abaft the beam or vice versa; and, furthermore, one is obliged to present the beam at such moments; further still, one of the two phases, either that of the bearing forward of the beam or that of the bearing abaft the beam, will be very short, as may easily be seen by calculating (with the fundamental relation) how rapidly the distance varies between two ships that keep each other bearing in the same general direction from the beam.

From this arises the idea of *keeping constant some value of the distance included in the zone of maximum utilization, on a suitable polar bearing*, whenever this may be possible.*

Evidently, the first condition necessary in order that the distance may be constant, is that of keeping the enemy bearing abaft the beam when he has us bearing forward of the beam, or vice versa.

The necessary relation between the speeds and the polar bearings in this form of movement is that which, in the fundamental relation, makes $\frac{dr}{dt}=0$; that is to say:

$$V_A \cos \alpha = V_B \cos \theta,$$

* The French admiral, Fournier, in his book called "La flotte nécessaire" (1896), was the first to study the combat with limited distance, putting the question in the following terms: The task of the vessel that wishes to draw profit from an advantage in speed is to maneuver, presenting his side in such a way as always to keep his adversary at the most effective range of his guns, without allowing him to approach within a distance arbitrarily fixed as the limit of safety. He studies the maneuver of the swifter ship on the basis of the following theorem: If two ships having speeds V_A and V_B ($V_A > V_B$) start at a distance r_0, and the swifter vessel follows a logarithmic spiral with its pole in the initial position of the slower ship, and inclined to the radii vectors in such a way as to keep the pole bearing at an angle whose cosine is $-\frac{V_B}{V_A}$, while the slower ship steers on a radius vector, the distance between the two ships varies until it returns to r_0, when the swifter ship passes ahead of the other. Fournier based himself on the hypothesis that the slower party, with the intention of diminishing the distance, might follow a rectilinear course, or keep his bow constantly on the enemy. In consequence of this, and of the fact that the faster ship, which passes over arcs of a logarithmic spiral conformably to the theorem aforesaid, has not the enemy constantly bearing in a sector of maximum offense, the maneuver with limited distance in the way proposed by Fournier is not acceptable. (See our study entitled "La velocità nella tattica navale," in *Rivista Marittima* of January, 1900). Nevertheless, Fournier's book efficaciously contributed to the progress of Tactics by initiating the study of long-range battle. Following Fournier came Commander (now Admiral) Baggio-Ducarne, who, studying the application of Fournier's criteria (*Rivista Marittima*, April, 1897), adjudged to Admiral Saint-Bon the merit of having, in 1885, perceived and demonstrated, in a tactical exercise, the advantage that a ship, swifter and more powerful than another, may draw from long-range battle. Comandante Ronca first pointed out the convenience of keeping the distance constant (*Rivista Marittima*, June, 1897). (Author's note.)

which we will call *the equation of constant distance.* It results from this that, theoretically, a ship, A, can maneuver at a constant distance from another ship, B, in two ways: 1st, at a *constant speed,* pre-establishing V_A, and determining the polar bearing α on which he must keep the enemy by means of the equation

$$\cos \alpha = \frac{V_B}{V_A} \cos \theta,$$

so that α is constant if B keeps θ and V_B constant; 2d, on a *constant bearing,* pre-establishing the polar bearing in which the enemy must be kept, and assuming the speed

$$V_A = \frac{V_B \cos \theta}{\cos \alpha},$$

so that V_A is constant if B keeps θ and V_B constant.

Each of these methods presents grave inconveniences. Brief considerations suffice to show that, in general, *with one of the above-mentioned methods, if the maneuvering of the enemy is not rational, our maneuvering also cannot be the most opportune.*

With the method at a constant speed, if B keeps A on a variable bearing, θ (as may happen, for example, when B keeps the course constant), α must also be variable. If $\theta = 90°$, α must also be $90°$; corresponding to $\theta = 0$ and $\theta = 180°$, we have, respectively, $\cos \alpha = \frac{V_B}{V_A}$ and $\cos \alpha = -\frac{V_B}{V_A}$. Consequently, if the enemy should constantly present his beam, in applying this method our ship should act in the same manner, which is illogical. If the enemy has our ship bearing in line with the keel or in a sector of minimum offense, with the values that the speed ratio may assume in practice, our polar bearing also would generally be outside of a sector of maximum offense. Moreover, if $V_A > V_B$, $\cos \alpha < \cos \theta$; and hence, supposing B to maneuver rationally and keep A in a direction of maximum utilization, the ship A, in order to keep the distance constant and develop the maximum speed, must bring the enemy to bear nearer to the beam, or, in a direction that may be a less defensive one.

With the method on a constant bearing it might be necessary to vary the speed between very wide limits; that is to say, from the value $\frac{V_B}{\cos \alpha}$ to the value *zero* corresponding to $\theta = 90°$.

Neither of these forms of maneuvering can, in an absolute way, be held to be acceptable, as has already been said concern-

ing that with the limited distance; but, instead, it will be easy to see how the three methods, considered together, permit of formulating practical rules of great simplicity.

We may reach such rules with the aid of the following observations:

I. It would be absurd to vary the speed in the way that might be required by the method on a constant bearing, but limited variations of the speed, from the maximum to a speed inferior by four or five knots, are acceptable.

II. Analogously, it may be admitted that our sight vane may be moved from a direction of maximum utilization as much as 15° or 20°, approaching nearer to the beam, or reaching an extreme limit of the sectors of maximum offense.

III. When the enemy keeps our ship bearing in a direction very near the beam, the variation of the speed and of the bearing within the limits above mentioned is not sufficient to keep the distance constant; maneuvering with a limited distance is then rendered necessary, and we need not be concerned about having to present the beam at intervals, because the enemy is continually in that disadvantageous condition.

IV. When the enemy, for reasons that we shall specify, can control the variation of the distance and avails himself of that faculty, it is evidently necessary to develop the maximum speed and steer with the sight vane on an extreme limit of the sectors of maximum offense, thus hindering the maneuvering of the enemy as much as possible. This being said, the rules for the practical application of the criteria alluded to are evident.

40. *Maneuvering in Long-Range Battle.*—Our ship is, by hypothesis, within the limits of distance that are held to be advisable. We have the usual disk provided with a sight vane. On it, *PP'* (Fig. 22) indicates the direction of the keel; *OS* and *OS'* are the limit directions of the sector of maximum offense *SOS'*.

Let us suppose that the enemy has our ship bearing forward of the beam. We steer on a constant bearing, arranging the sight vane in the direction *OM*, which is the after direction of maximum utilization, and we develop the maximum speed.

Three cases may present themselves; that is to say, the distance may remain constant, or it may increase, or it may diminish.

In the first case we have but to continue to steer with the sight vane in the direction *OM*.

ase, that is, when the distance increases, con-
th the sight vane on OM, we reduce the speed
it is possible that, within the limits established
(four or five knots), we may find a speed that
nce constant. When this is not realized, even
or limit of the speed, we gradually move the
to the beam, without, however, going beyond

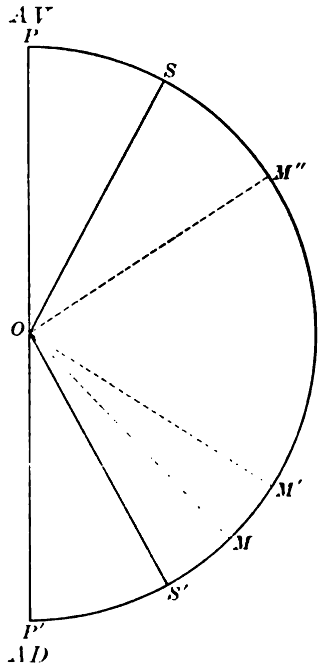

FIG. 22.

limit OM'. If, even with this limit direction,
ncreases, we continue to steer with the sight
ion OM' and, before arriving at the superior
:e, we change our course, steering at the mini-
e sight vane in the direction OM'' symmetrical

:, that is to say, when the distance diminishes,
imum speed, we move the sight vane gradually
limit being reached, if the distance continues
ty not move the sight vane further toward the

stern, because that would be without the sector of maximum offense. Evidently the enemy is master of the maneuvering, and we must continue to steer with the sight vane in the aforesaid direction in order to minimize the variation of the distance. We should maneuver in a perfectly analogous manner if the enemy had our ship bearing abaft the beam.

41. *Rotation of the Line Joining the Adversaries.*—It results from the foregoing that, with two adversaries that maneuver rationally, besides being able to presume that they may steer maintaining constant polar bearings, the *typical case* to be con-

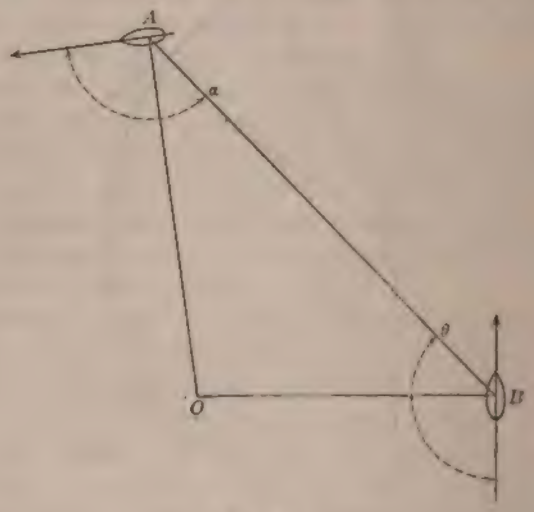

FIG. 23.

sidered is that wherein, for a certain time, the distance remains about constant.

It is easily demonstrated that, *if two ships steer keeping constant polar bearings, and if the distance also remains constant, the tracks followed by the two adversaries are concentric circumferences.* In fact, by equation (11) of Chapter I (Section 37) the radii of curvature of the tracks described by the ships A and B in the case we are now considering are constant, and hence the tracks are circumferences; moreover, the normals to the tracks always intersect in a point O (Fig. 23), by which we have

$$\frac{OA}{OB} = \frac{\cos \theta}{\cos \alpha},$$

and hence, from the equation of constant distance, there results

$$\frac{OA}{OB} = \frac{V_A}{V_B},$$

and O is then the common center.

Fig. 24 shows the circumferences passed over by ships supposed to be initially at A and B; the centers O' and O'' of the circumferences that the ships follow in presenting sides of the same name or sides of opposite names are naturally found on the perpendicular to the initial course of the ship B, which is supposed to have A always bearing to port. Conformably to

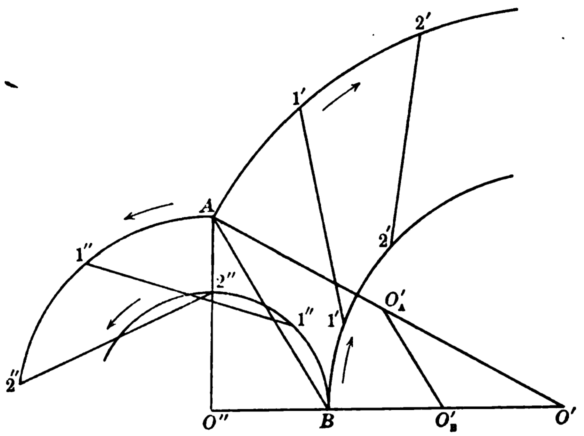

FIG. 24.

what has been demonstrated in a general way in Section 37, the radii of the circumferences with their center in O'' are shorter than those of the circumferences that have their center in O'; and hence, in the movement with sides of the same name, the rotation of the line joining the adversaries is more rapid; which is important in relation to what is said in Section 21 concerning the natural elements.*

* The demonstration that the tracks of A and B in the case under consideration are concentric circumferences can also be made without having recourse to the aforesaid formula (11). In fact, if the center of curvature of the tracks of A and B were not coincident and fixed, they would be, for example, at O'_A and O'_B on the respective normals to the tracks; and by virtue of equation (8′) of Chapter I, and of the equation of constant dis-

The expediency of presenting to the enemy the proper side in order to keep or to secure an advantageous position with respect to the sun, or to the coast, or to the strategic objectives, is clear: therefore it is important to fix the ideas concerning the rapidity of rotation of the joining line.

The speeds, the polar bearings and the distance being constant, it results from equation (10) of Chapter I that *the speed of rotation of the line joining the adversaries is constant.* With the said formula we may calculate the time required for the joining line to rotate through a given angle.

We note that, if the speeds of A and B are equal, or, if $\alpha = \theta$, the point O' is at infinity, and the tracks of the two ships are parallel straight lines; while the circumferences with their center at O'' are reduced to one only, since $\rho_A = \rho_B$. This being the case it is clear that, *applying the type of maneuvering indicated in the preceding section,* conditions near to these will be realized when the directions of maximum utilization of the ships are not inclined in a sensibly different way. We may conclude from this that, *in general, when the adversaries present to each other sides of opposite names, the rotation of their joining line may be held to be very slow.*

When, on the other hand, the two adversaries present to each other sides of the same name, the rotation of the joining line is very rapid; thus, supposing A and B to be distant from each other 9000 meters, that they have each other bearing at 45° from the beam, and that $V_A = V_B = 15$ knots, the time necessary to rotate the joining line through 90° is only 23 minutes. However, for the case in which, by presenting to the fire the side of the same name as that of the enemy, we may expose ourselves to having a rotation of the joining line in a direction contrary to that desired, let us see how the rotation can be obtained by presenting the side of the opposite name.

It is clear that, in order to have the maximum component of the speed normal to the joining line, it is necessary to maintain the maximum speed instead of reducing it according to the cri-

tance, the line $O'_A O'_B$ should at all times be parallel to the joining line AB. But, considering the positions A' and B' of the two ships after the time dt, $O'_A O'_B$ should also be parallel to $A'B'$, and hence we should fall into an absurdity. In order to avoid this we must admit the coincidence above mentioned. (Author's note.)

terion given in the preceding section; and it is expedient to have the enemy bearing as near as possible to the beam, or, in one of the pre-established limit directions *OM'*, *OM"*, of Fig. 22. If with the sight vane in one of these directions the distance changes, we continue to steer in this way up to the limit established for the distance, and then steer in the symmetrical direction with respect to the beam. So doing, by virtue of the aforementioned formula (10), the ship *A* sees the line joining it with the enemy incline itself in the direction in which the ship is moving, if there is realized the condition

$$V_A \sin \alpha > V_B \sin \theta.$$

When *A* has sufficient speed to permit the existence of this inequality, it is best to recognize that the above-mentioned maneuver is suitable only when a rotation of moderate amplitude is required. In fact, if $V = 18$ knots, supposing the bearing on which *A* steers to be such as to keep the distance constant, r, θ, and V_B being the same as in the example previously considered, two hours are required in order to rotate the joining line through 90°; but it may be observed that, to make the joining line rotate through 270°, by presenting to fire the side of the same name as that of the enemy, the necessary time would be $\frac{270}{90} \times 23$ minutes, or a little more than half the time above mentioned. Hence, for rotations of great amplitude, *avoiding the inconveniences of keeping the enemy bearing too near the beam and gaining in celerity, it would be advisable to produce the complement in 360° of the required rotation.*

We may then establish:

1st. In order to maintain an advantageous position with respect to the sun, to the coast, or to the strategic objectives, we must present to fire the side of a name opposite that of the enemy, applying the general type of maneuvering indicated in the preceding section.

2d. We must present to fire the side of the same name as that of the enemy, applying the general type of maneuvering, when in that way the rotation of the joining line takes place in the desired direction, or when the amplitude of the desired rotation is very great.

3d. If in presenting the side of the same name as that of the enemy the rotation takes place in the direction contrary to that

desired, if, furthermore, the desired rotation is of small amplitude and we have a speed superior to that of the enemy, it is well to present the side of the opposite name, maneuvering by the rules just pointed out. When, however, we have not sufficient speed for obtaining the object established, it is necessary to maneuver as has been said in the preceding case.

It results from the foregoing that it may be easier to maintain an advantageous position than to acquire it. In general we can have but little faith in being able to apply the second of the preceding deductions, for it is presumable that the enemy, when he sees our ship present the side of the same name as his own, may change the maneuver by exposing his other side if he deems it to his interest to avoid a rapid rotation of the joining line. Still the contrary might happen when, for example, the enemy has commenced firing before we have done so, and does not wish to change the side, in order to avoid the disadvantage to the fire control that would be produced.

Evidently it would be a fine game if the enemy were obliged to present a determined side, as would be realized if his offensive field were unsymmetrical with respect to the longitudinal axis.

42. *Change of Distance.*—I. It is clear that in order to obtain a change of distance without sacrificing offensive power, a ship *A* must develop the maximum speed and keep the enemy bearing at the forward limit of a sector of maximum offense if he desires to diminish the distance, or at the after limit if he desires to increase it. The enemy *B*, in order to maneuver by the same standard, hindering the change, must keep *A* bearing respectively at the after limit, or at the forward limit of a sector of maximum offense.

By the fundamental relation, the ship *A* may impose a change of the distance when

$$V_A \cos \alpha > V_B \cos \theta;$$

α and θ corresponding in this case to the limits of the sectors of maximum offense.

II. Let us now suppose that the two adversaries are at the limit of offensive contact. The object of the ship *A* is to engage in a decisive combat with the ship *B*, which, not being able to prevent the approach of *A*, proposes to limit the action to the maximum distances. It is easy to see that if the ship *B* is powerfully armed on the line of the keel (has powerful head and stern fire), it may

be interested in keeping the stern always toward the enemy. In fact, if *A*, steering by sight vane, keeps *B* at the forward limit of a sector of maximum offense, calling this bearing α—counted, as usual, from the bow—by the fundamental relation (wherein we must, in this case, put $\theta = 0$) it results that the necessary condition to the end that the distance may not increase, is

$$\frac{V_A}{V_B} \geqq \frac{1}{\cos \alpha}.$$

Consequently, the minimum speed necessary for *A*, in order to develop against the enemy the maximum power without falling out of range, is that corresponding to the greatest amplitude of the sectors of maximum offense; or it is determined by the relation

$$\frac{V_A}{V_B} = \frac{1}{\cos 30^\circ} = 1.15.$$

Putting $\Delta = V_A - V_B$, we have

$$\frac{V_A}{V_B} = 1 + \frac{\Delta}{V_B},$$

or

$$\Delta = 0.15\, V_B.$$

Hence it results that the superiority in speed required by *A* is so much the greater, the greater is V_B; or, while a greater speed per hour of 1.5 knots is necessary for the object mentioned against a ship of 10 knots speed, when $V = 20$ knots, there is required an advantage of 3 knots.

This said, the following observations should be made:

1st. The aforesaid advantage in speed simply permits the ship *A* to keep *B* under the fire of his guns, but does not admit of his diminishing the distance.

2d. As has been pointed out in Part I, Chapter I, some ships can develop a strong intensity of fire in the direction of the keel—much greater than that of which they are capable in the sectors of minimum offense; moreover, it is well to remember (Section 3) that, at the maximum fighting distances, a ship presenting itself end on to the enemy's fire diminishes in that way the enemy's percentage of effective hits.

3d. It is true that, being removed by a small angle from the direction of the keel, one enters a sector of minimum offense; but this may also happen for the limit direction of the sector of

maximum offense on which *A* is steering; in other words, if *A* desires to provide against the inexactness of steering by sight vane, rather than at 30° from the bow, it ought to keep the enemy at about 35°; but then, for $V=20$ knots, there would be required an advantage in speed of 4.4 knots, rather than of 3 knots. It seems, then, that we may affirm that, even supposing the sectors of maximum offense to have the maximum amplitude, without a great advantage in speed, not presumable in practice, the situation is not very decidedly favorable for *A*. On the other hand it appears to be clear that *B may not be interested, in this case, in conforming to the general rule, which is that of keeping the enemy bearing in a sector of maximum offense.*

If the ship *A*, then, has not a speed which greatly exceeds that of *B*, his desire to succeed in the intention to diminish the distance constrains him to keep his bow toward the enemy; which obliges him to endure, for a very considerable time, a disadvantageous situation, when the strength of his fire in line with the keel is inferior to that of the enemy. In fact, it is sufficient to note that, in order to diminish the distance by at least 2000 meters—which it is important for *A* to do in order to engage in a quickly efficacious action—the necessary time is that which would be required for passing over the said space at a speed $V_A - V_B$; or, it is more than 20 minutes if the difference in speed is about 3 knots.

When, however, the ship *A*, besides being the swifter, has also a more powerful fire in line with the keel, it is clear that *B* will be obliged to bring it to bear in a sector of maximum offense; we then come back to the case already discussed at the beginning of this section.

In the general case of two ships opposed to each other on the open sea, we may then conclude:

1st. That, for declining a decisive tactical action, powerful stern fire may constitute a compensation for inferior speed.

2d. That a speed superior by two or three knots, even if associated with the maximum amplitude of the sectors of maximum offense, cannot be held to be sufficient for imposing the tactical action; powerful fire ahead is more important for securing that object.

43. *Capacity for Tactical Initiative.*—A ship has complete liberty of tactical initiative with respect to another if it can

impose or decline offensive contact; and if, in case it engages, it can give to the action the form that is deemed preferable, or can control its development.

After what we have said, it is easy to estimate in what degree such liberty is possessed; that is, to determine the elements of the *capacity for tactical initiative* with reference to the usual hypothesis of ships opposing each other on the open sea.

I. In the general case in which the distance at which the ships sight each other is beyond the limit of offensive contact, equality of speed is sufficient for avoiding said contact, while, to impose it, a superior speed is necessary.

II. For the slower ship, the capacity for limiting the offensive contact to the maximum distance is inversely as the capacity of the faster ship to impose a decisive combat; in practice, they depend essentially upon the relative potentiality of the two adversaries in fire in line with the keel.

III. As between two ships that keep each other bearing in sectors of maximum offense, the capacity for controlling the distance depends upon the relative conditions of maximum speed and of amplitude of the sectors of maximum offense; these two factors should be considered together for each combatant; or, a compromise between them is possible. Indeed, as is seen from the fundamental relation, the aptitude of a ship to control the distance depends upon the product of its speed by the cosine of the angle formed by the longitudinal axis with a limit direction of the sector of maximum offense. If the forward limit direction of this sector forms with the direction of the bow a certain angle, $\alpha-\mu$, this places the ship in the condition in which it would be found if the limit direction formed the angle α, but the maximum speed V had an increment, kV, k being a coefficient that renders

$$V\cos(\alpha-\mu)=(V+kV)\cos\alpha;$$

hence we have

$$k=\frac{\cos(\alpha-\mu)}{\cos\alpha}-1.$$

If we were considering the after limit direction of the sector of maximum offense it would be necessary to put $180°-\alpha$ in place of α, and $180°-\alpha+\mu$ instead of $\alpha-\mu$; hence the formula found for k is a general one.

In the three hypotheses (Section 2) of sectors of maximum offense extended to 30°, 45°, and 60° from the beam, the values

of k for $\mu=5°$ are respectively 0.14, 0.08, 0.04. For $\mu=10$ values of k just given are doubled; that is, k may be held proportional to μ. For the ordinary case in which the two have sectors of maximum offense with amplitude near to forward of and abaft the beam, it is then to be remembered *if a ship has, with respect to another, the limits of the secto maximum offense nearer to the longitudinal axis, every 5° of ference of this kind, or every 10° of advantage in the total tude of the sectors, is equivalent, in the particular regard under discussion, to an increase of speed of 8/10 of a kn every 10 knots.*

IV. Generally the maneuvering of a ship in the duel i veloped by keeping the adversary in one of the four fractio the sectors of maximum offense; as, *SOM″*, *S′OM′* of Fi included between the limit directions of said sectors an directions nearest the beam to which corresponds a suff defensive capacity; *the wider these partial sectors are, the gr is the liberty of maneuvering.* From this comes the super that is derived from greater thicknesses of armor than tho the enemy, or from guns with greater penetrating power.

V. To the end that a ship may be able to impose the rot of the line joining it with the enemy, it must be able to ol with respect to the enemy, a greater component of its speed mally to the said joining line. This depends upon the rel speed conditions and upon the angles that, for each ship directions *OM″*, *OM′* of Fig. 22 form with the beam. *In this ticular respect an advantage in speed is hence equivalent greater thickness of armor or to a greater penetrating pow the guns.*

From the preceding observations it results that the import of the various elements of the capacity for tactical initi cannot be considered in a one-sided manner.

It is incontrovertible, then, that the said capacity increases the amplitude of the sectors of maximum offense; but with amplitude (Section 3), the ratio between the potentiality in with the keel and that of the said sectors diminishes; nor, o other hand, can an increase of the said amplitude render a vantage in speed less desirable. This deduction is to be bo mind when considering the types of ships.

44. *Maneuvering at Close Range.*—Let us examine the manner in which maneuvering at close range may be developed; that is to say, within the limits of the fourth tactical zone distinguished in Section 24, when the employment of the torpedo is possible, and hence, from what we demonstrated in Section 9, it is preferable to have the enemy bearing abaft the beam.

It must be borne in mind (Section 3) that the probability of being hit by the guns at close range, while it remains constant if the direction in which the enemy bears is not removed more than 45° from the beam, rapidly increases beyond that limit; therefore it is not advisable to have the enemy bear more than 45° from the beam, or, it is not advisable to utilize a greater amplitude of the sectors of maximum offense.

In maneuvering at close range, then, we should generally have the enemy bearing in a direction of maximum utilization abaft the beam, and should present to fire the side of a name opposite that of the enemy; because in that way it is possible to steer by sight vane (Section 37), which permits of satisfying the tactical necessities in a continuous manner.

If the enemy has our ship bearing forward of the beam, it is well to develop the maximum speed or a speed somewhat inferior—as has been said for maneuvering at long range—with the intention of keeping the enemy at the desired distance. For some moments we may change the angle of the sight vane when this may be necessary in order to launch the torpedoes; we must not, however, forget the risks we run in presenting the beam at close range; and hence it is necessary to establish it as a rule, not to execute, within the limits to which we are referring, any passage from a bearing abaft the beam to one forward of the beam, or vice versa. In consequence of this, except in the case to which we shall now allude, the launching tubes of the forward sectors should be utilized by launching for an angled run.

It is clear that if the enemy maneuvers analogously, keeping our ship bearing abaft the beam, neither of the combatants within the radius of action of the torpedo; the duel then remai an artillery battle exclusively.

Let us consider the situation of two adversaries that, at cl range, have each other bearing forward of the beam.

The distance diminishes; the ship that, at a certain momen order to avoid a further diminution of the distance, brings

enemy to bear abaft the beam, while the enemy continues to keep it forward of the beam, presents the beam during the change, and hence makes—as has been said before—a perilous maneuver.

If neither of the adversaries makes such a maneuver, and if they present to fire sides of opposite names, they come to close quarters.

When the sides exposed to fire are of the same name, if one of the adversaries desires to fight at close quarters, the other cannot avoid it; let us suppose that this is not desired by either of the combatants. They keep the course constant; and, if the courses are parallel, the polar bearings are the same at any moment. *Thus, passing on opposite courses, inasmuch as it leads the two adversaries to present the beam simultaneously, may seem an opportune form of maneuvering for two combatants, both desirous of using the torpedo.* However, it is to be noted that only in appearance are the combatants in identical conditions; *the more strongly armored ship acquires the advantage,* owing to the fact that the adversary abandons maneuvering on the bearing which would permit him to compensate for, or at least diminish, the greater vulnerability of his armor.

Under the hypothesis that the enemy has our ship bearing forward of the beam, we may then conclude:

1st. It is not necessary to have the enemy bearing forward of the beam at close range, unless we intend to provoke a battle at close quarters, or unless we have decided to undergo it.

2d. Not desiring battle at close quarters, the maneuver of having the enemy forward of the beam may be rational when our ship has side armor of greater thickness.

45. *Limit of Battle at Close Quarters.*—Below a certain distance from the enemy, a ship may be assured that, if a collision takes place, it may run into the other, instead of being itself run into.

Theoretically, when we have the greater speed, we run no risk in having abaft the beam an enemy who has us forward of the beam; but it is necessary to take unforeseen elements into account, and hence the necessity of not having the enemy abaft the beam below a certain distance, determined under the hypothesis of equal speeds and equal evolutionary qualities for the two combatants. This distance marks *the limit of battle at close quarters.*

ısider two ships, A and B (Fig. 25), that have each g respectively the one astern and the other ahead, e the same speed, V. Let us hold their evolutionary circular. We must seek the maximum distance, AB, ermit A to arrive at K' at the same time as B.

nit that the arcs BK and MK' are passed over in the which is not rigorously true, since one is described

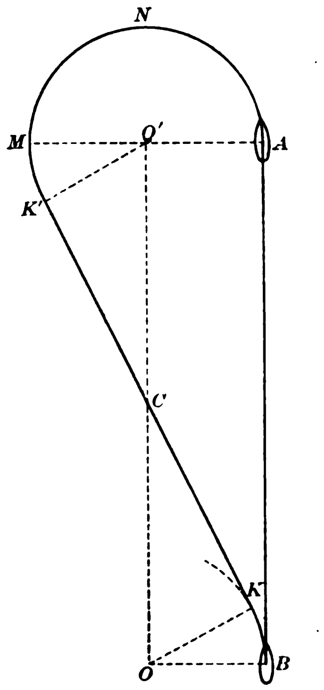

FIG. 25.

ning, and the other at the end of an evolution. KK' sed over in the time that A takes in passing over the ference ANM.

: by ρ the radius of the circle of evolution, since A one-third of his speed, we have

$$\frac{KK'}{V} = \frac{\pi\rho}{\frac{2}{3}V},$$

$$KK' = \tfrac{3}{2}\pi\rho.$$

For the *defensive* maneuver with respect to ramming, it is not necessary—as it is for the *offensive* maneuver—to tend to keep the enemy at an angle from the bow less than that at which he keeps us, but it is sufficient that the two bearings be equal. On the basis of this consideration, the form that it seems the initial phase of battle at close quarters between two modern battleships should assume, is not exactly that which appeared probable in the tactics of the ram. Within the limit of distance indicated in the preceding section, the two ships will run to meet each other; but, instead of steering bow to bow, they will keep on their guard, following parallel courses; there will thus be, not a grazing by, nor a passing at very short distance, but a passing at a distance of some hundreds of meters, such as to permit making use of the guns and the torpedoes.

After passing by, and before the enemy gets out of the after sector of maximum offense, it is evidently logical to turn in order to keep him in that sector; therefore the two ships will turn at that time toward each other; and afterwards, for the same reason, they will change course again, thus following parallel broken straight lines, having each other bearing abaft the beam; and hence, they will draw away from each other. Given—but not conceded—that the passing by may not have had the gravest effects, if one of the ships desires to provoke a repetition of the preceding phase, it will have to turn toward the enemy in order to bring him to bear about 45° forward of the beam; the other ship will be obliged to turn also in the same way.

It is to be noted that while admitting it to be unlikely that one of the ships will maneuver, after the passing by, in order to ram, the other—unless his mobile and evolutionary qualities are greatly inferior—by turning with the helm hard over, will be in time to present his bow to the adversary. Hence we deem rational the opinion of to-day favoring the abolition of the ram.

47. *Particular Cases.*—In practice—as was said at the beginning of this chapter—particular circumstances will determine the form that the duel will assume.

Ordinarily one of the adversaries will be sensibly weaker than the other, and will seek to reach a movable or a fixed center of protection. Hence it is possible that the enemy may or may not be found between the center of protection and the ship that desires to decline battle.

In the second case the weaker ship will evidently have to run; and will place itself in safety if it has an advantage in speed, or if its inferiority in speed is not too great, and if the radius of action in which the said ship must operate has been conveniently established, taking into account the speed of the enemy's strongest ships.

In case, however, it is indispensable to reckon with the enemy in order directly to reach the center of protection, the weaker ship could run away if it had an advantage in speed, and seek to throw the enemy off its track; but when it is feared that in this way the ship may run into preponderating hostile forces, it will steer directly for the center of protection, thus coming into a fight at close quarters with the enemy.

This is the case in which encounters between torpedo boats very often take place, especially during blockading operations, as has been demonstrated in the Russo-Japanese war. The destroyers and torpedo boats of the defense, having come out during the night in search of the enemy's battleships, returning at daylight toward their base, may encounter on their route similar units of the enemy; and as, for the said vessels, running to seaward would signify exposing themselves to certain loss, they will be obliged to fight. The adversaries will steer for each other bow to bow, so that the fight will first be developed in line with the keel, and afterwards, by passing each other on opposite courses, at very close quarters. After this, the units of the blockading party, unless they have sustained injuries that impede their freedom of maneuvering, will invert the course, following the enemy to the vicinity of the base.

Between protected cruisers, when the weaker is the slower, and has not a potentiality of fire in line with the keel that is sufficient for maneuvering by the rule given in Section 42, or when for any reason it cannot avoid a decisive action, it will seek to escape from the bad situation by provoking battle at close range. The stronger ship will evidently be interested in keeping the enemy at a distance.

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THE HYDRAULIC INTERACTION BETWEEN PASSING VESSELS, CALLED "SUCTION."

A LECTURE DELIVERED BEFORE THE SCHOOL OF MARINE ENGINEERING, U. S. NAVAL ACADEMY, ANNAPOLIS, MARYLAND, APRIL 17, 1911.*

By SIDNEY A. REEVE, M. E., Consulting Engineer.

The subject of suction is regarded by most pilots with considerable fear. They all know, from hearsay, from practice, and from experience that suction exists, and that it is a force which, when uninterrupted, is usually unconquerable. Yet, no one seems to be able to lay down the principles of its action for the guidance of pilots. Indeed, to most of them, it is an undefinable force. Out of nearly fifty pilots whom I have heard testify in these cases in court, the majority have never had any experience with a case of suction. Others have had merely one, usually the case in which they were called. So that the ordinary pilot or sea-faring man cannot, from his own experience and judgment, tell when suction is to be encountered and when it is not.

I shall show that the term "suction," which is a term uniformly used, is usually misleading. We speak of attraction, interaction, reaction and repulsion; and replusion is about as common as is attraction. Repulsion, however, much less often leads to serious results, and so does not get into the records as frequently attraction in the matter of collisions.

I will first run over briefly a few cases of suction collision order to give you a general idea of how they happen, and then take up the matter more in detail. The phenomenon has known on the records from which I quote since 1869. I

* For a full understanding of these notes reference should be m Charts of New York Lower Bay and of Delaware River.

should say at the start that what I have to say is not drawn from by any means an exhaustive investigation of the records. I have not had time to do that. The only records which are accessible to the layman for this purpose are the records of the courts, and frequently in the cases coming before the courts suction is not known as a contributing factor to the accident, and so no mention is made of it in the indexes. I have not had time to make an exhaustive search, but I have a sufficient number of instances to illustrate all which we need at the present time.

The phenomenon has increased in later years with the growth in tonnage and speed of vessels, and a corresponding increase in depth of channels. At the same time, the records go back a good many years. The earliest case I have is one which happened in 1869. In that year two Sound steamers, the *Narragansett* and the *Providence* left their piers in North River and proceeded around through Hell Gate, the *Narragansett* being the slower vessel and in the lead. She was overtaken by the *Providence*, the faster vessel, and then occurred a phenomenon which is a part of the suction principle, and that is that the slower vessel was towed by the faster vessel by hydraulic interaction all the way up through East River. She was enabled to maintain a speed equal to the faster vessel without any change in her steam or engines. When the vessels got into Hell Gate the equilibrium became too unstable and they collided. The slower vessel, as usual, plunged into the quarter of the faster vessel.

The next instance on the list happened in 1872, and was a collision between tugs, the *McCandless* and the *Unit*. This was in comparatively deep water. There are no other details given, except that the collision was of the most common type, that is, the slower vessel had been almost overtaken and passed and then plunged into the quarter of the overtaking vessel. I might explain, in going over these, that we can immediately classify them into two types of collision, by attraction and by repulsion. All these which I am running over now are in the attraction class.

The next case happended in 1878 or 1879. A fleet of excursion boats going to one of the International races off Scotland Lightship was led by the tug *Hartt;* this tug was overtaken by the excursion steamer *City of Brockton*. As the *Brockton* went by and had almost passed the tug, the bow of the *Brockton* being about one hundred feet ahead of the bow of the *Hartt*, on the starboard

hand of the *Hartt*, the tug took a sudden sheer to starboard, toward the *Brockton*, then straightened up again. Then the commander put her under a starboard helm, and she took a very sudden plunge into the port quarter of the *City of Brockton*, running into the port paddle, and was almost overturned.

In 1880 there was a collision off Corlear's Hook, in the harbor, between the tug *Imperial* going up near the wharves and the ferry-boat *Garden City*, following after. In that case the vessels were on converging courses.

In 1885 occurred the first case of two large trans-Atlantic steamers, the *Aurania* and the *Republic*, leaving New York Harbor, just about to enter the turn into Gedney Channel, near the Fairway Buoy, There again the overtaken vessel got under the quarter of the vessel leading. It is interesting to note that just fifteen years later there was a similar collision of two vessels of about the same tonnage, in almost exactly the same place, and under almost exactly similar circumstances, the case of the *Martello* and the *Mesaba*. I will take that up later, in detail.

In the '90s there was a collision between the steamer *Owen* and the smaller steamer *Atlantis*, in the Detroit River. In 1898 there was also a collision between two freighters in the Delaware River, the *Aurole* and the *Willkommen*.

The last one that has come to my attention was a collision between two liners in New York Lower Bay, the aftermost vessel again colliding with the one preceding. That case is more interesting because there was plenty of water, and the vessels were going at half speed, or at about three-quarters speed.*

Of the cases where the vessels were diverted, instead of being mutually attracted, as in the above cases, and no collision resulted, the records do not give us such information; because, in a majority of these cases, nothing happened after the diversion. If there happens to be sea-room, the diverted steamer recovers her course, with plenty of time to do so. Occasionally, there are obstacles in the way, and then happens an accident which brings the matter into the records.

The first one of this type occurred in the early '70s, in Hell Gate. The steamer *Doris* had passed around on the starboard of the tug *Minnie*, having two barges lashed to the beam. The tug

* Compare also a case of *Hawke* and *Olympic*, Southampton, England, September 20, 1911.

was moving very slowly and the steamer attempted to pass. She had full speed on, driving the tug over on the rocks of the Sunken Meadows, so that the outermost barge was sunk.

In 1874 there also occurred a collision in New Haven Harbor between the steamer *C. H. Northam* and a tug hauling a string tow. The tug was hauling three barges abreast and following them two more barges abreast. In that case the suction of the steamer dropped the two farthermost barges astern, so that the tow lines were broken, and the stern-wash fetched them up so as to collide with the forward barges, one of which was sunk.

In 1890 occurred the triple accident between the *Siberia*, the *Ohio* and the *Mather* in the Detroit River. Two of the vessels were going in the same direction, at unequal speeds, the *Siberia* was passed by the *Mather*, and the *Siberia* was diverted from her course to such an extent that before she could recover she collided with the *Ohio*.

The last case on the list is a case so recent that I shall not mention the names of the steamers, the case being still before the courts; but it is most interesting because of the size of the steamers it concerned, and because of the completeness of the data which we have.

I have one instance here of a third class of suction collisions, and that is in which the suction deflects the vessels when they are passing in opposite directions. The courts have always held that when vessels pass in opposite directions, there is not time for the interaction between the hulls to take effect.

If we turn now to the question of the hydraulic theory, you will find that it is comparatively simple. The only hydraulic principle involved you are already familiar with, and that is the principle of the conservation of energy in a mass of water, whereby the sum of the kinetic head and the static head is a contant, although either is readily convertible, within certain limits into the other.

The hydraulic interaction, of course, is produced and governed by the water-flow from the bow of the stern of each vessel, through a temporarily restricted channel in which pressure variations are set up in order to produce motion. In order to bring that to your attention I have put on this diagram an outline of a venturi meter (Fig. 3). The chief difficulty, I think, encountered in attempting to discuss these matters with laymen is the one which they have in relation to all hydraulic action except that of direct impulse in

the direction of motion of the water. They are constantly looking for the swash of displacement waves (Fig. 2), or the current from a propellor or paddle-wheels and attempt to account for the action by the *direct* impulse of the current of water. So far as I have been able to understand the matter, that has seldom or never anything to do with these accidents. The only case in which that does play a part, so far as I am aware, is in a case where a large vessel leaves a slip—there have been several accidents of that sort—a slip in which barges are moored. In that case the action of the current from the propellers or the paddle-wheels in a restricted area empties the slip of water, and really brings a fair fraction of the thrust of the engines to bear upon any other vessels in the slip, drawing them away from their moorings and leading to later collisions. In that case, it is a very simple affair of direct impulse from the engines. The speed of the vessels is usually almost zero and has nothing to do with it. Those cases are of no guidance in the avoidance of collisions in navigation; they are to be avoided by the use of common sense.

What we have to deal with in all suction cases is to determine, not the forces *alined with* the direction of motion of the water, but the forces *at right angles to* the direction and motion of the ship and the water. That is the point which is hard for the layman to grasp, but you are all of you sufficiently familiar with hydraulics to understand that.

In order to bring out what I have in mind, I have drawn this diagram of the venturi meter (Fig. 3), with the head *A*, the throat *B*, and the outlet *C*. The velocity is comparatively low in entering, and comparatively rapid in the throat. It is then reduced to the original figure at the end. In these diagrams I have used red arrows to indicate velocities and black arrows to indicate forces. There is normally in that conduit, under all velocities, an unlike condition of pressure. As the velocity is increased by the reduction in area at the throat, that static pressure is more or less drawn upon to supply kinetic energy to the water. Ordinarily, it still represents a positive pressure, above atmospheric; but if the dimensions are chosen for the purpose, you can easily have a sub-atmospheric pressure in the throat, shown by the arrows on the outside of the conduit. That is commonly taken advantage of in hydraulic suction-apparatus. The dimensions are made such that there is a distinct deficit of pressure at that point, and then, if it is open

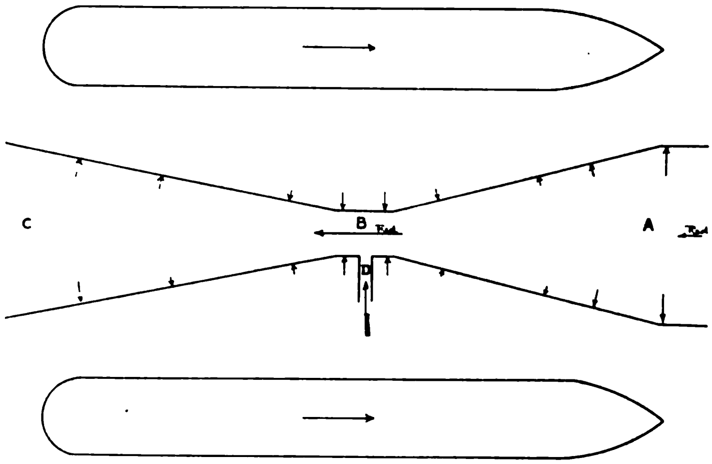


FIG. 3.

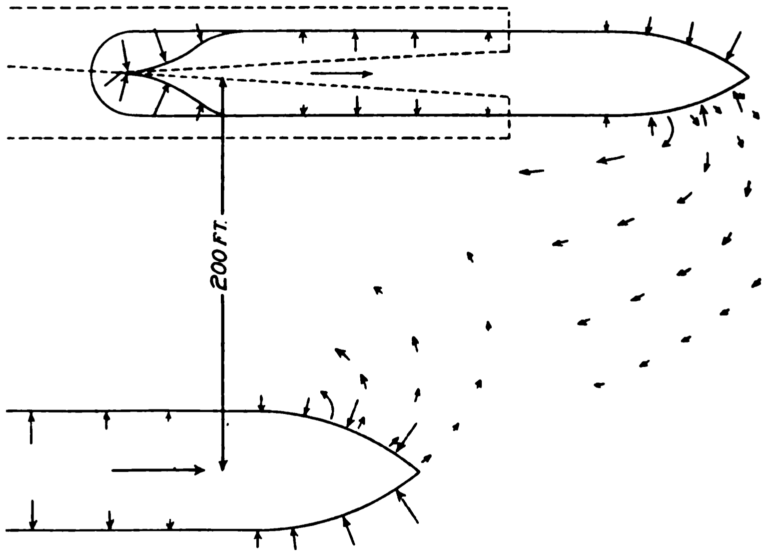


FIG. 4.

here, *D*, there is a condition in which water will be drawn into the throat of the conduit, although the rest of the conduit may be under comparatively heavy pressure. As the water slows down again that kinetic energy again converts itself into static, and we have the regaining of the internal pressure.

In the passage of a vessel through the water, we have, of course, the displacement of water from bow to stern, in order to permit the passage of the vessel. I have here a chart (Fig. 1) in which I will call attention to the displacement of the water, the arrows showing the general direction of the flow. I call attention to the fact that the velocities must be least around the bow of the ship and greater amidships and towards the stern. That is the reason for the practice, in the old sailing ships, of building bluff-bowed vessels. You are well aware that the shape of the stern has a good deal more to do with the speed of the vessel than the sharpness of the bow.

It is those velocities that fall parallel with the axis of the vessel that develop suction between the two ships. If the vessel is in open water, its velocities extend in all directions from the vessel, and of course, theoretically and mathematically, they are inversely as the distance, and so would never become zero. Actually, they are limited to a sensible degree in all vessels. These velocities show the passage of water taking the shortest cut to its destination, except as it develops sufficient resistance.

When two vessels are proceeding in the same direction, the flow on the outer side of either vessel is, of course, normal. But between the two vessels we have action quite similar to the ordinary venturi meter. Here is water between the two stems of the vessel (Fig. 3), and that water has to find its way through this restricted channel between the vessels. Technically, it must have an increased velocity, a positive velocity, which can be determined from the nature and depth of the water, and the distance of the stems apart, and the speed of the vessel. That determines the deficit of pressure amidships. The two hulls of the vessel must develop this deficit of pressure, exactly as do the sides of the conduit of the venturi. That deficit is proportional to the square of the speed of the flow through, and that again depends upon the restriction of the channel.

The flow of water, however, cannot be accomplished without a gathering of initial static head to promote it. That is what

develops the ordinary body-wave of vessels as they move through the water.

In order to avoid confusion, I wish to state clearly that I am not now speaking of the ordinary bow-waves that go off from either bow of a vessel, the waves of natural equilibrium in water as shown in Fig. 2. The bow-wave is dependent upon the speed of the ship only, and, unless the water is very shallow, it is an equilibrium wave. Nor am I referring to the waves that follow after the vessel, in two curved lines (same Fig.), the "echelon" waves. This wave I now refer to is not a natural wave of equilibrium, but (Fig. 8) is a constrained wave; it is not a true wave at all. It is a conformation of the surface of the water, enforced upon the water by the constraint of the ship, the bottom and the pressure effect. The theory of waves may be said not to apply to this phenomenon at all. This constrained wave, as I have called it, consists in a surplus of pressure above average mean sea-level at this point *A*, (Fig. 8 and 8a), which must be accomplished in order to set the water into motion. So here at *A*, we have water pushed ahead of the vessel, and rising as it is pushed—and that represents, by the way, the cross-section of a wave which extends in a fairly straight line, laterally. On river steamers you get the best chance to observe that. I have noticed it in the upper Hudson, where the reaches are fairly restricted. Standing in the bow, and looking ahead along the shore, you can see the surplus or excess following along either shore, away ahead of the vessel. The water is pushed ahead for quite a distance. The height is very little, but the tonnage of water moved is very great.

The principle of ordinary static equilibrium insures the fact that at the point of maximum velocity the level must be lower than mean sea-level. Therefore at that point (*B*, Fig. 8) we have water moving at minimum velocity. Here (*C*, Fig. 8) we have water moving at maximum velocity. Here (*D*, Fig. 8) the water is comparatively at rest; but because the equilibrium has once been disturbed, it does not come back to its original position. Then are developed the natural waves which follow after the vessel, the "echelon" waves, the length of which depends upon their speed.

This diagram (Fig. 3) represents one of the positions of unstable equilibrium, the suction-position when two vessels, going in the same direction, have come to this point. The forces then are nearly equal to the surplus pressure outside either ship, and are

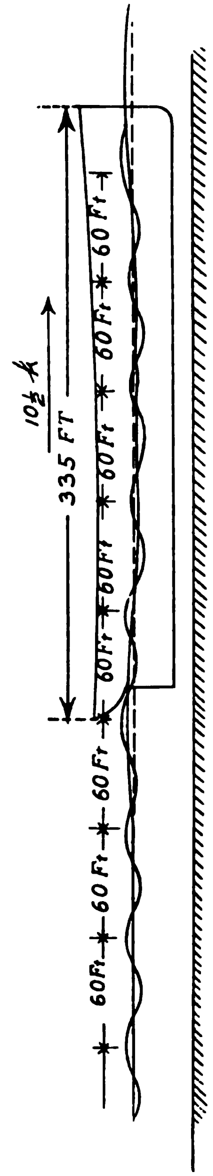

335 FT
10½ K
60 Ft
60 Ft
60 Ft
60 Ft
60 Ft
60 Ft
60 Ft
60 Ft
60 Ft

FIG. 5.

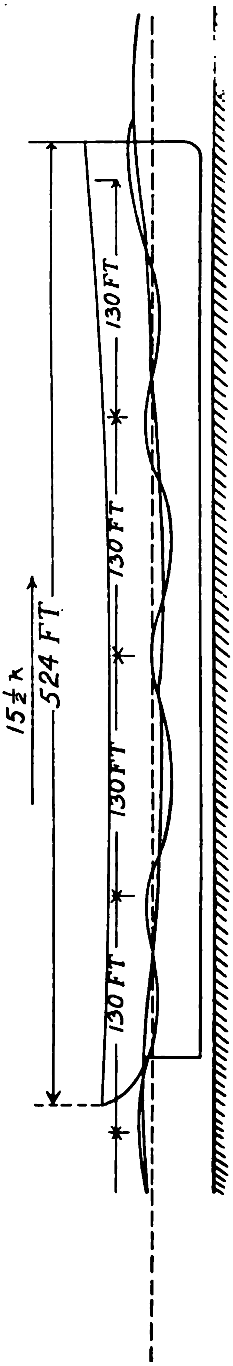

524 FT
15½ K
130 FT
130 FT
130 FT
130 FT

FIG. 6.

g the ships bodily together. Since ships do not move easily rs through the water, that particular phase of the situation ldom has any real effect. Ships sailing side by side are not rought bodily together, parallel with each other. The only in looking at this diagram is that it shows an intermediate etween the two dangerous phases. That is the case where

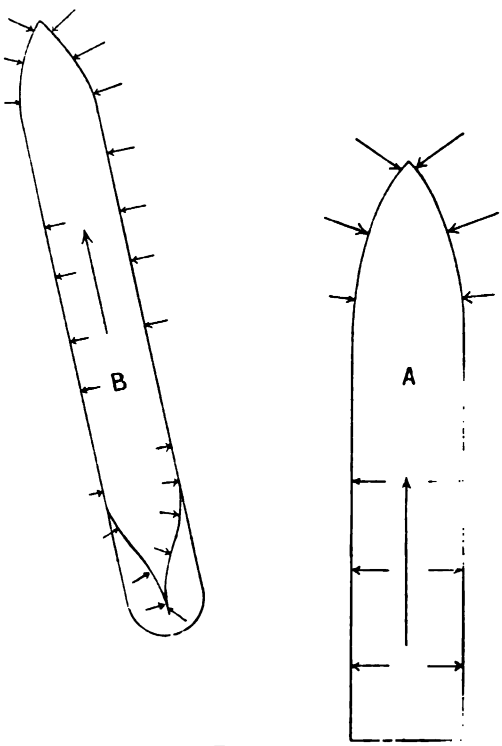


FIG. 7.

are of equal length, where their bow-waves are in phase ch other.

trouble is passing vessels comes, however, when the waves of phase—when the stern-waves are out of phase—with trough, and trough to crest.

'e here a diagram, drawn to scale, of one of the liners in st recent collision (Fig. 8a), on the same scale as this dia- Fig. 8). This is the slower vessel being overtaken (Fig. 8), s the larger vessel (Fig. 8a). If I place these diagrams

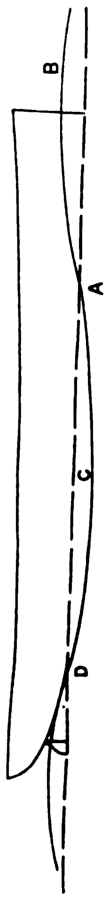


FIG. 8.

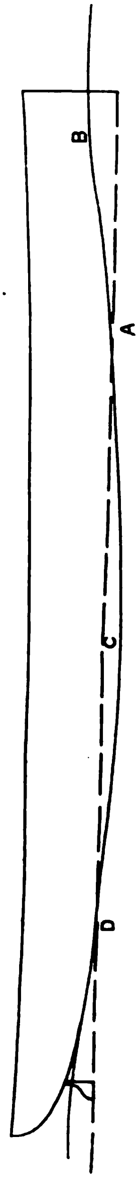


FIG. 8A.

›ver the other in this way (Figs. 8 and 8a), the water-lines ide. That shows the first phase of a larger vessel, the faster l, overtaking a smaller vessel. The two crests coincide in this consequently the crests are intensified. The two vessels d be repelled one from the other by the accumulation of sur-pressure in between. That phase very seldom produces any erous effect.

we slide the diagram 8a along until we come to this position of Fig. 8, opposite *C*, of Fig. 8a), we get the first dangerous e. We now have the crest of the stern-wave of the overtaken el abreast the trough of the wave of the overtaking vessel. result is a dropping away of the pressure on the port bow of aster vessel, and a surplus pressure on the starboard beam of lower vessel. These two forces very seldom have any effect. overtaking vessel is usually the larger, and also the longer el. Her tonnage and her moment of gyration about the hori-al axis are much greater than that of the smaller vessel. So arger vessel is very seldom affected.

he smaller vessel, on the other hand, is affected amidships; the e acting on her has a tendency to draw her bodily sideways ugh the water to the larger vessel. That, of course, cannot any appreciable effect. At the stern, however, we find that stern-surplus of the smaller vessel has offset the natural deficit teral force amidships of the overtaking vessel. That cannot t the overtaking vessel, because it is a force amidships. But e smaller vessel it makes trouble. This force pulls the water from the starboard quarter of the overtaken vessel, and rs her stern in toward the overtaken vessel, and that sends the out correspondingly.

at leads to the first class of suction-action, the repulsion of vertaken vessel. If the vessels continued in that position, were near enough together, this vessel (Fig. 8) would be n off to port, and would not ordinarily recover.

fact, I might explain that the only state of stable hydraulic ibrium for two vessels passing in this way is when they are ght angles to each other. In other words, this smaller vessel t in stable equilibrium until it finds itself in the trough of stern waves, athwart its original course. I heard one pilot y to being in charge of a steamer going down New York Bay, n he was passed by a larger liner; and he was diverted in that

way. Fortunately, he had plenty of sea-room, and it was necessary to reverse his engines; but by the time the ship stopped she was out eight points from her original course, across the channel, and the other vessel had gone on. There nothing for him to do but work his ship around again. Th to say, equilibrium is obtained, and the suction-forces cease en only when the ships are at right angles.

If we advance these overlapping vessels to the next po (Figs. 8a and 8), we find here the counterpart of this dia (Fig. 3). This position develops the most serious conditi all; that is, when the point B of the overtaken vessel comes site this point C of the overtaking vessel. That, of course, water on the port beam of the larger vessel. But this forc have no effect because it acts amidships, and because the ve so large; but it does draw the water away from the starboar of the overtaken vessel, and gives her a sheer toward the l vessel. That gives rise to the worst possible state of af because, if, in Fig. 3, instead of drawing the ships in parallel tion, we should give either or both of them a slight sheer to each other, you can see that we would very much restrict the of cross section in proportion to the volume of water p through. The most restricted area would not be amidship near the bow, and, being near the bow, is would create a defi pressure between the two vessels, and sheer them still fu together.

We would therefore again have unstable equilibrium, the in bility of which is increasing very rapidly (instead of decrea as in the case of the diverted vessel), and which must inevit lead to collision. The movement of the two vessels toward e other multiplies the force, and the force multiplies the moti Matters are accelerated in geometric progression. There is time to do anything. The force very quickly becomes uncontr able.

Such an action as that— if we suppose this to be the overtak vessel (Fig. 8a)—would occur when the vessel of Fig. 8a had beam about opposite the bow of that of Fig. 8; and the instant vessel of Fig. 8 begins to sheer, she throws off her own wa from her bow, and sheers more and more, and usually give plunge into the other vessel, striking abaft the beam. To m sure that I make myself plain, I will imagine the vessel of Fig

to have reached the position with *C*, of Fig. 8, opposite *B*, of Fig. 8a, and by the time she has got there the vessel of Fig. 8 has sheered over and has struck at *D*, Fig. 8a. That is the commonest instance of suction-collision.

Here I have drawn a diagram of a vessel being diverted (Fig. 7). You can follow the venturi action, the water between these two stems developing an increased force on the beam of the vessel *A*, and on the quarter of *B*. The forces set up there—I have drawn the vessel with the helm hard a-port—are such as could not be overcome by any reverse helm action whatever, particularly as the reverse action is attempting to deflect water which has already been deflected in that direction.

That condition of unstable equilibrium is apparently a very complex one. It not only has to do with the constrained waves, but is frequently complicated by the natural waves of the vessel, so that the vessels would pass through two or more phases of unstable equilibrium. That is particularly true when one vessel is considerably longer than the other, so that the body waves of one are longer than those of the other.

This diagram is also drawn to scale (Fig. 6). That is to show, in the first place, the very scant water in which large liners find themselves in the channels of our harbors. There is almost no passageway for water beneath the vessels. There is some space there, but it is of very little use for transmission of water, and actically all the water has to find its way around one side or the ner.

These figures show that sixty feet was the natural length of the ve for a boat of this type (Fig. 5). The vessel of Fig. 6, hower, has a natural wave length of 130 feet, so that the echelon ves which combine are about two to one. In the large vessels own that did not have any particular effect. But, in the case a small vessel like a tug, it would. For instance, the tug *Hartt* s of about the right length to reach from one crest to the next st of the natural wave of the *City of Brockton*, so that the tug s affected not only by the constrained wave, but also at the point ere the crest of the natural wave came along. That is the tural explanation why the tug took a sheer toward the *Brockton* d then straightened up, and then, as the second crest came, took r second plunge and ran into the port pad-

That primary and secondary sheer occurs in a number of t cases, and that is the natural explanation. We might possibly into it mathematically, but we should not get a much d idea; because the one thing we cannot get in suction-cases is q titative results, or exact data. In the first place, the position vessels can never be established correctly. Whenever a colli does occur it means that the positions change so very rapidly t the exact point is almost impossible of discovery, so that we no exact data whatever.

It has, however, brought out one interesting thing, which is the ordinary seafaring man, even of the best class, is quite i able of estimating distances over water in yards or feet. handles his vessel by eye and judgment, in reference to dire and distance, from a light or buoy. But when it comes to t lating that into feet, it is pretty hard for him to go into cour tell the exact position of the vessel.

In a case shown on these diagrams, one of the vessels wa of the most prominent liners leaving New York. Her comm came on the stand and testified about her course down New Bay, and as he did so I charted his testimony. But if his had been where he said it was, she would have been drag mud all the way down the bay. And that is not anything natural. It is usually safe, and is the common practice of the c to take a point half way between the testimony of the two sid nearest the probable truth; but in no case is the data exact.

The only exact investigation work to determine the effect suction-action has been done by Naval Constructor Taylor, a have had some of his charts reproduced here to show how experimental work verifies the theory of the matter. (See Vol 1909, *Transactions Am. Soc. Nav. Archts. & Marine Engrs.*

Mr. Taylor made his experiments in a tank with two mo each about twenty feet long, and each having the same disp ment of 3000 pounds and, with different lines for the mi across section in special cases. These diagrams (Plates 2, 3, show the results he got.

The little arrows show the deflecting forces which he meas In these experiments the vessels were fixed in their courses held in position, and were moved in the direction parallel to other. The deflecting forces could not set up any sheer, of c They were measured in the initial stage of suction only.

ese diagrams show the distance between the two vessels. the two vessels are far apart, and the forces are .7 at the (lower R. H. diagram, Pl. 2), and .3 and .4 at the bow. The ions are the deflecting forces, expressed as ratios in terms of esistance.

ere (middle R. H. diagram, Pl. 2) the models were .24 of length apart, and the stern forces have been increased to y. Those of .3 and .4 increased to .6 and .7. Here (upper I. diagram Pl. 2) they are brought within .19 of their length the deflecting forces have risen to 1.3 and 1.1 at the bow and ind 2.2 at the stern.

Ir. Taylor placed the hulls so close together that the water in ank was quite deep, comparatively, in relation to the size of the els. Here are his experiments with another pair of models ing fuller lines, showing the same thing, Pl. 3. At seven-ths of their length apart the forces are very slight, .002 at stern and .03 at the bow (lower R. H. diagram, Pl. 3). Those es are so slight that they probably do not mean very much. he upper R. H. diagram, Pl. 3, the distance apart is one-half of length, and the forces have risen to about .05 and .12. In nd set from right, Pl. 3, are the full line models at distances rt which correspond to those of the fine line models of Pl. 2. corresponding figures.

hese diagrams (Pl. 4 and Pl. 5) show the effect of these forces he form of curves. Mr. Taylor has taken all of his results in ns of the overtaking vessels. I think that is misleading, be-se it is only in unusual cases that the overtaking vessel is cted; it is nearly always with the overtaken vessel. He ex-ns, as to this, that the names might be interchanged, and it ild simply mean a rearrangement of the diagrams. Not until position is reached shown in upper .6, .4 and .2*L* diagram, 3, do we find the repulsion at work on the stern, and attraction he bow. Out here (upper middle diagram, Pl. 3) the bow is er repulsion. An interesting thing appears with the stern er strong repulsion, when the vessels are practically clear of other (lower .6*L* diagram Pl. 3).

n the positions shown in lower .2, .4 and .6*L* diagram, Pl. 3, the rtaking vessel has passed and is in the lead, and the forces ch then act on the two vessels are clearly indicated. None of e diagrams show how rapidly the forces must increase as the els sheer toward one another.

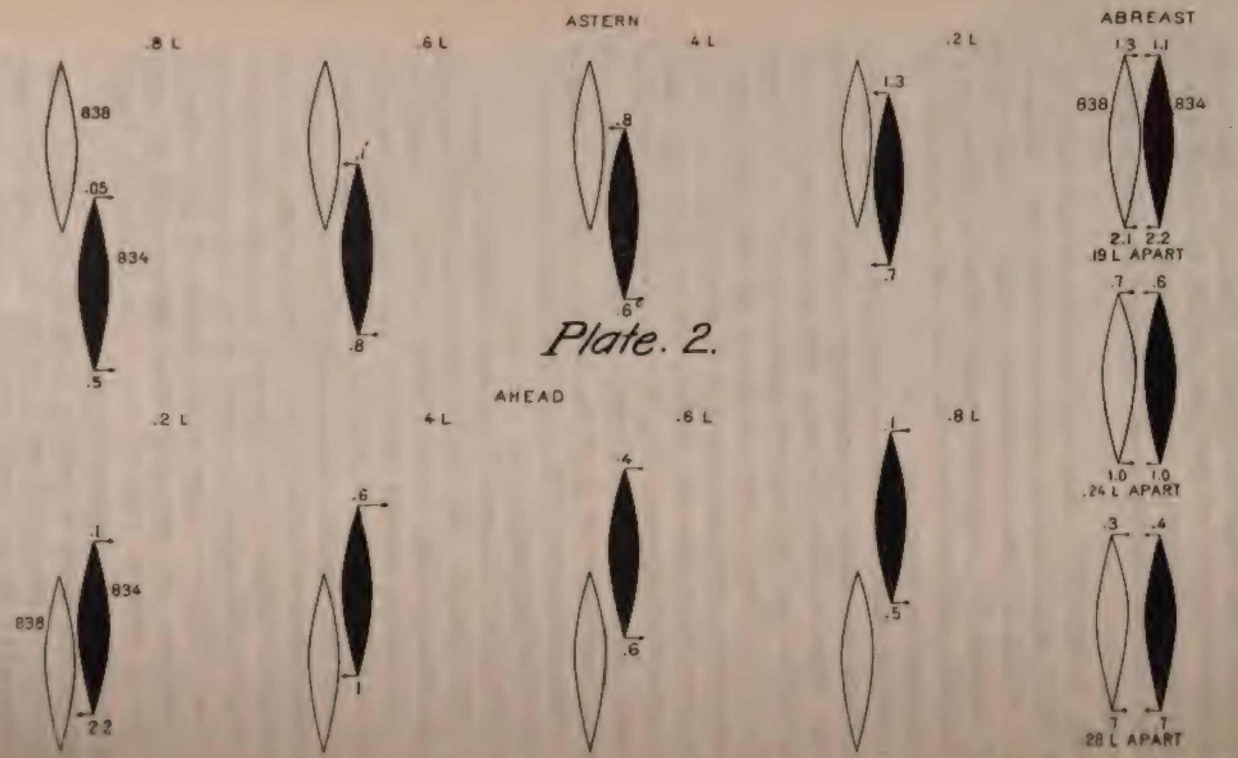
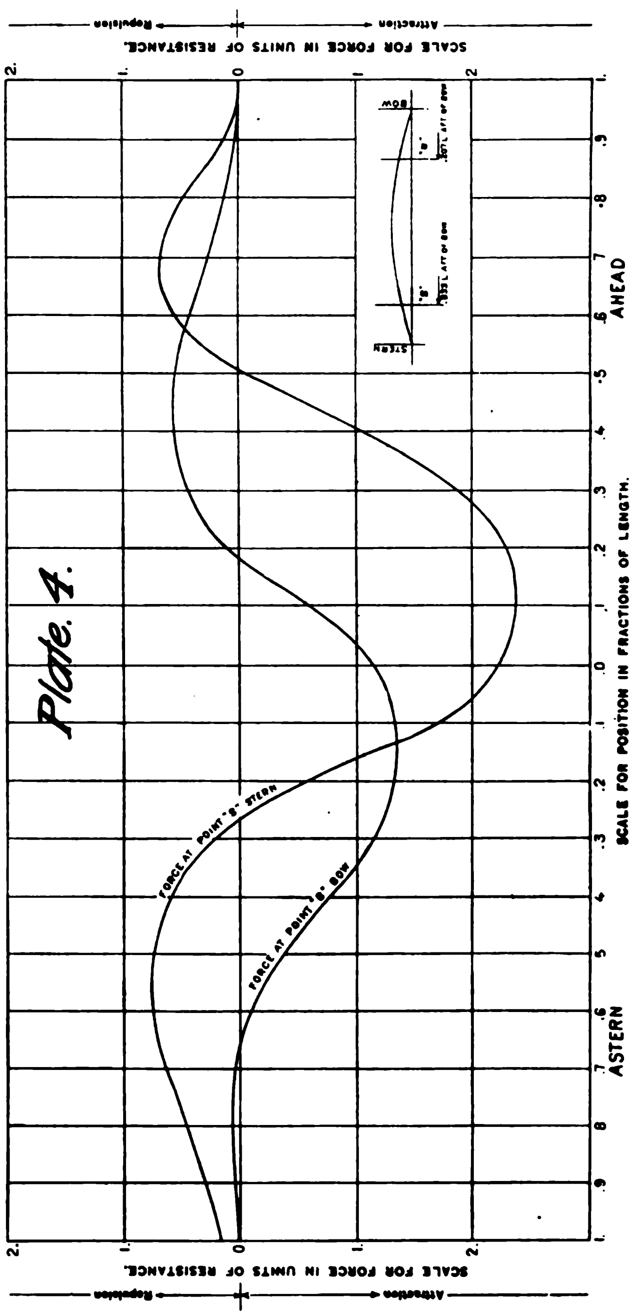


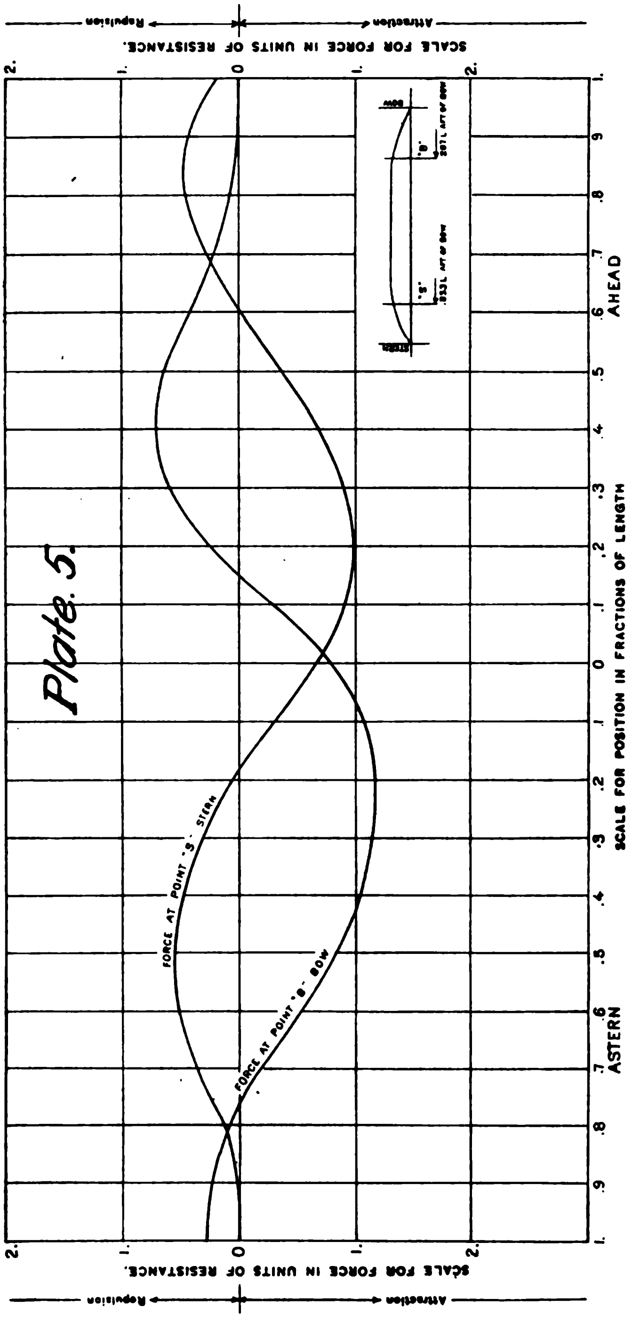
Plate. 2.

FORCES UPON MODEL 834 WHEN PASSING MODEL 838. THE ARROWS SHOW THE DIRECTIONS OF THE FORWARD AND AFTER FORCES. THE FIGURES SHOW THE AMOUNTS EXPRESSED AS FRACTIONS OF THE TOTAL RESISTANCE. SPEED OF MODELS, [illegible] KNOTS.

FORCES UPON MODEL 858 WHEN PASSING MODEL 866. THE ARROWS SHOW THE DIRECTIONS OF THE FORWARD AND AFTER FORCES. THE FIGURES SHOW THE AMOUNTS EXPRESSED AS FRACTIONS OF THE TOTAL RESISTANCE. SPEED OF MODELS, 2 TO 3 KNOTS.



FORCES FORWARD AND AFT, ACTING UPON MODEL 834 WHEN PASSING MODEL 838, EXPRESSED AS FRACTIONS OF THE TOTAL RESISTANCE. DISTANCE OF CENTER LINES APART, 3.90 FEET. SPEED, 2 TO 3 KNOTS.



FORCES FORWARD AND AFT, ACTING UPON MODEL 858 WHEN PASSING MODEL 866, EXPRESSED AS FRACTIONS OF THE TOTAL RESISTANCE. DISTANCE OF CENTER LINES APART, 3.90 FEET. SPEED, 2 TO 3 KNOTS.

The diagram of Pl. 4 suggests the same result in another way. The figures on the base-line show the relative position of the two vessels, the two vessels being initially just beginning to overlap. The ordinates are repulsion above and attraction below. As the vessels come abreast there is a turning-moment or tendency to sheer the vessel from its original course, and that tendency is proportional to the distance between the two curves. When we get to the point shown by ordinate .1 ahead, we get a maximum moment of sheer. The result of that moment is the deflection of the vessel, but if there is plenty of sea-room, there can be no harm.

The diagram of Pl. 5 is the corresponding one for two other models. They show the same thing, except in the diminution of the forces, and give corresponding results. You will notice that there is considerable difference between this curve and the one we just examined, although the models are being towed at the same speed, in the same water and at the same distance apart, showing that the lines of the vessel have a good deal to do with it. It is some such effect as that which makes it hard to predict whether a suction-collision is going to take place or not. We have not yet reduced this to numerical form. At the points on these curves shown at .4 astern the moment tending to bring them into collision is much greater than elsewhere, and would make the danger of collision much greater, although an almost equal deflective effect is shown at .4 ahead.

I shall not attempt to bring Mr. Taylor's findings into any concise mathematical laws, but I think it is important to point out that the experimental data, so far as they go, corroborate the simple theory of the matter. So I have taken the figures of Mr. Taylor's experiments and tried to draw a few simple deductions from them.

The thing of primary interest is the distance apart of the two vessels. That, of course, is what every navigator wants to know, how closely he may approach with safety. There again, we cannot give any exact statement to cover all cases; all we can say is, that whenever you get in what is known as a suction-position your vessel will be in unstable equilibrium, and you must look out.

However, in following this theory (Fig. 3 of lecture) the deflecting forces ought to be proportional to the ratio between the water trapped between the stems and the area of the passage-way in the center. Let B represent the distance from stem to stem, D

the distance between the rails amidships, S the deflecting force at the stern in terms of the resistance of the vessel and A a coefficient; then the deflecting force would be proportional to the square root of B over D minus one.

$$S = \text{deflecting force} = A \sqrt{\frac{B}{D} - 1}.$$

If I attempt to get a coefficient for A of that expression it will give me some sort of mathematical relationship for the thing. I find from Mr. Taylor's experiments given in Pl. 2 that the values for A lie between 0.787, 0.952 and 0.783; and from the first three experiments of the second set (Pl. 3) I find the figures 0.662, 0.613 and 0.625. That means that these values fall fairly near together. They are in rough agreement, and I draw the inference from that that the value of A is from 0.6 to 0.8 for those models, under varying distances apart. Whether that would have a corresponding value for different models of larger vessels, we have no data at all. It is worth while to say that the matter is consistent and harmonious.

If we abandon that theory and go upon the assumption that you merely find the numerical relationship between results, we find that we can state roughly that when the distance apart between rails is stated as a fraction D of the length, and the total attraction at bow and stern together is stated as a fraction of the resistance we have

$$A = \frac{C}{100D^2}.$$

wherein the constant C has a value between 1 and 2. That is purely an abitrary relationship, but that will give some sort of an idea. A applies, of course, only to models 20 feet long, abreast, moving at 2 to 3 knots, the equivalent of ships 400 feet long, abreast, moving at 9 to 14 knots, in deep water.

Now, again, if we compare the results between these two sets of odels, one of full lines and the other of finer lines, we should see rn diagram such as this that the effect must be proportional the water displaced. If we take the ratio between the aggrete midship cross-section for the two models of Pl. 2, and that the models of Pl. 3, towed abreast, we find that ratio to be 1.27. we take a similar ratio between the maximum suction-moments the respective cases, we find that to be 1.20 That also confirms in the idea that the explanation which is drawn from the theo-

retical basis is about correct, and we find that the experimental results, so far, are in consonance with that.

I think it will be interesting to go over some of these actual collision cases and see how they follow out our ideas. The first one on the list is the collision of two Sound steamers at Hell Gate, but we have no data in regard to them which we may discuss. The interesting thing to note is how a slower vessel hung on to a faster vessel and was carried up East River by this hydraulic interaction. That position is one of unstable equilibrium. It is exactly the same thing as a sailing vessel running before a gale on a high sea. If the commander has that in mind it can be avoided, as a rule; it is a dangerous position, and the slightest lapse of care will lead to serious results. She is not in equilibrium until she is fairly in the trough of the sea; after she has come to a stop she can be gotten on her course again.

The next one was of chief interest because it was the first instance of a primary and secondary sheer and collision between vessels of different dimensions. The next one, the *Imperial* and the *Garden City* collision, occurred some thirty years ago near the western shore of the East River, quite close to pier 54 (see chart, New York Harbor), when the ebb tide was coming out. The tug *Imperial* was running up quite close to the wharves and the ferry-boat *Garden City* overtook her. The vessels were close together, in deep water. That case was confused by two contributing causes. The courses were slightly converging, and there was a tidal eddy, which would give the tug a sheer toward the *Garden City*. For that reason the court did not discuss any question of suction-sheer as a primary cause. But to my mind, because the courses were converging, and the distances were very restricted (I think there was only some 50 feet between two rails), the probabilities of suction were very great.

The next case is a larger and more important case, that of the *Aurania* and *Republic*, two large liners leaving New York. Your familiarity with the charts will enable you to follow the argument. (See chart, New York Lower Bay, lower main ship channel, lower Swash Channel, out past the Hook and past South Channel, and turning into Gedney Channel). Large vessels coming that way have to make a turn of about four points to get in through the channel, and the width of the channel is restricted for large vessels. There have been two collisions at the entrance to Gedney Chan-

under identical conditions. The *Aurania*, the faster vessel. ed the *Republic* well up in the Upper Bay and came down in Lower Bay ahead. She had to take the Horseshoe Channel, eas the Republic got through the Swash Channel and came ahead. The *Aurania* overtook the *Republic* after they had n to make the turn in the Gedney Channel. We will find that nean depth to the westward of the buoy runs about 40 feet; at the turn that shoals quite suddenly to 30 feet. A restric-of depth of water of 10 or 11 feet, when the ground was only et below the bottom of the ship anyway, is equivalent to a very en diminution of throat-area in the venturi meter. That is ys a dangerous case, for this reason: The natural speed is in shallow water than in deep water, and when the ship runs deep into shallow water the kinetic energy stored in the e hull converts itself into suction-energy. She runs into a ition which will be very quickly seen to be dangerous.

cases like this the causes producing the suction-conditions h I have described could not be very well anticipated. The gy which was contributed to deflecting the vessels would be momentum-energy of the two hulls. The speed would be ged suddenly from the natural speed in deep water to the ral speed in shallow water. The kinetic energy between these speeds would be converted suddenly into a constrained wave de the ship. That gives rise to unstable equilibrium of the t sort.

nay say here that the chance incident which drew me into the e line of this discussion was that I happened to see something e daily press about one of these collisions that occurred in the ey Channel, and I thought we might get some interesting data could place the vessels accurately at that point.

ne other collision quite similar to this was that between the *nba* and the *Martello*, which occurred in 1900, in the same , and almost in the same way.

ne collision, or rather the encounter, between the two large els represented to scale in the diagrams I have shown, the most nt one that occurred, was just at the mouth of the Swash nel, going down the Lower Bay. The vessel overtaken was ne easterly side of the channel. Just before she reached the th of the Swash Channel she was overtaken by the larger el. The larger vessel caused the smaller vessel to sheer to the

eastward quite a good deal. When the captain of the larger vessel reached the other side at the end of his trip he was very much surprised to find that his own vessel had been libeled for having forced the other vessel ashore.

The general depth in mid-channel in this case is fairly even; but there was a shoal spot at just about the place where the collision occurred, and I should say, in passing, that we might locate the collision at about that spot in the shoal. We were not able to get sufficiently exact data to do this with certainty, however.

In contradistinction to that idea there were two cases in New York Upper Bay, where the water is from 70 to 90 feet deep, and where the vessels were not going at full speed. That shows that suction-action may occur where the water is of considerable depth.

Of the deflections, except for this one I mentioned, I will describe only one. This is a collision on the Delaware River, just below Newcastle, (Southwest Range, see chart, Delaware River, with a shoal, pretty close to the range). A vessel coming down was passed by a vessel, overtaken itself by the *Willkommen*, which was overtaken by the *Aureole*. After the *Aureole* had almost passed, the *Willkommen* was drawn in, and there was a collision upon the port quarter. The *Willkommen's* engines were first slowed and then stopped. Whether that helped or harmed, we cannot say. It is the most natural impulse to shut off power. But the point is, that whereas the depth along the channel is four fathoms, the depth on the outer sides is three and three quarters, and three and a half; and the *Willkommen* naturally went toward the west to give the *Aureole* a chance to get through easily without running into shoal water. These boats were both drawing about tventy-four feet, and there must have been five or six feet of tide above the plane of reference, so that there was inshore about 27 feet, and further out about 30 feet.

The case of the *Ohio* (Fig. 9) was in the Detroit River. There was plenty of water sideways, but not so very much underneath. In that case the *Mather* overtook the *Siberia*, going in the same direction; the *Siberia* sheered to port, under influence of suction, ran off and collided with the *Ohio*, which was coming down in the opposite direction. That is one of the combinations that must be looked out for. There is a good rule in the west that if you meet two men coming down the pike, never let them pass on both sides

-ou at once, and it might be the same way in connection with sels passing.

The only other case I shall speak of at all is that of two vessels sing in opposite directions (Fig. 10). This was the case of the amer *Devereaux,* coming down Lake George, St. Mary's River. ere was a wide dredged channel which was restricted at a cer- . point by a natural restricted channel, and then a dredged nnel on beyond. The *Devereaux* coming down passed the tug

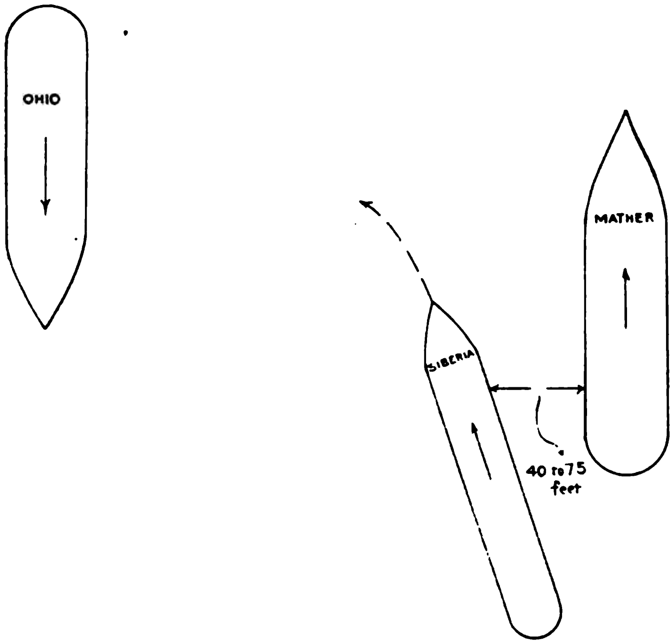


FIG. 9.

'som towing the schooner *Mitchell.* When the ***Devereaux*** got osite the *Folsom* she took a sheer and came into collision with *Mitchell,* breaking the tow line and driving her ashore. I have tched out the dimensions to scale with the cross sections drawn scale also. The *Devereaux* is drawn in the position where the rt assigned her, but that does not seem quite correct. At any e she was over near the bank. A vessel near a bank like that is ken of by the pilots as "smelling the bank." She is deflected m her course, and it is altogether likely that that was the

beginning of the phenomena there. The vessels were so close together that I feel quite sure, particularly in view of the position of the *Devereaux* when she sheered, that suction there was a contributing cause of the collision.

The conclusion which I have tried to draw from this is that we ought to have a better recognition of the subject. We ought to have more data to work with in this matter of collision between vessels. What I have said is all very plausible, but how far it

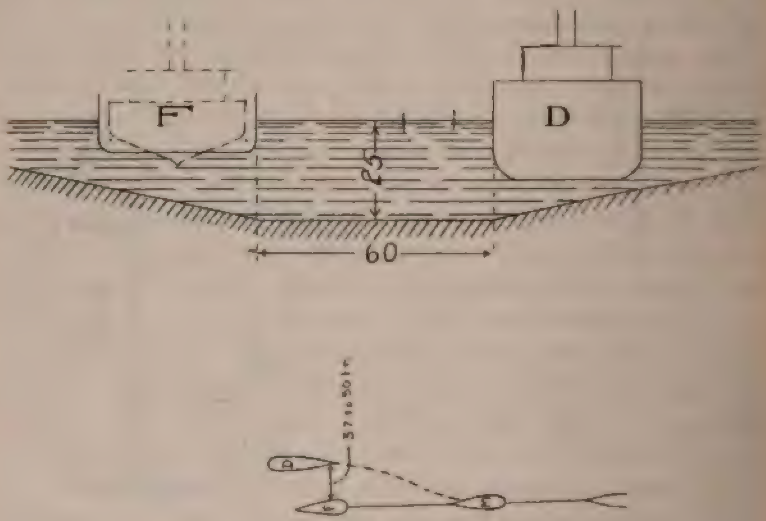


FIG. 10.

Devereaux—Mitchell Case.

Devereaux—Steamer, 270 ft. long, 37 ft. beam, 15 ft. draft, speed, 4 miles.

Mitchell—Schooner, 212 ft. long, 40 ft. beam, in tow, on 500 ft. line, of

Folsom—Tug, 180 ft. long, 35 ft. beam, $\left\{ \begin{matrix} 3 \\ 11 \end{matrix} \right\}$ ft. draft, speed less than 5 miles.

Displacement of D about 4 times that of F.

After collision, D passed within 30 ft. of another steamer without deflection of course.

would be justified by experience extended to a large number of cases of different dimensions is not certain. From these I cannot give you any quantitative rules as to how near vessels may approach and at what speed.

We ought to have a definite rule to cover such cases, particularly as steamers are getting larger and the channels are not changing;

the dredged channels are multiplying; they are no smaller, but vessels are getting larger and the channels are not, so that suction cases appear to be on the increase. It would not necessarily be an international rule, because these forces occur only in restricted waters, and each country could enforce its own rule, though the rule ought to be international and uniform. I am not a pilot at all, and I would not suggest what that rule should be, except that when an overtaking vessel signals for permission to pass a slower vessel it should be within the power of the overtaken vessel to signal, "I am slowing my engines; I fear danger," and that should enforce upon the larger and faster vessel the slowing of her engines also. I think, in all these cases that I have considered, if both vessels had been at half speed the collisions could have been avoided. It does not do any good for the overtaken vessel to slow her engines if the overtaking vessel passes at full speed.

EXTRACTS FROM A LETTER OF MR. REEVE, DATED NOVEMBER, 11, 1911.

So soon as I get into the work on the problems connected with suction I feel the need for more data. At the same time I am impressed with the realization of what a splendid machine for the collection of data the U. S. Navy might be, without expense, if directed somewhat to that end.

For instance, two items about which we need data is the thickness of the layer of eddies along the ship's skin, and the outline of the water-level along her side, both observed when the ship is under way at different speeds—or even at her standard speed only.

The midship cross-section of the hull effective for fore and aft displacement of water, as you well know, is greater than that of the metal itself, by a layer of eddies which are dragged along by the ship; but I have not yet run across any data as to the thickness of this layer, amounting to a foot or more, I should judge, on fast vessels, although it is easily observable over the side.

The distance at which suction-effect could be felt, transversely to the ship's course, could be known, if we had data as to the height of displacement-wave, at bow, mid-length and at stern, usual in vessels of her size and speed. But I have seen no collection of such data.

Indeed, the Department may already possess such data about its ships, of which I am not informed. I must go to Washington when I get this work a little further along, to look up a number of such things. If you have any suggestions as to where data may be found I should be grateful for references.

Yours very sincerely,

SIDNEY A. REEVE.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

OLLISION BETWEEN H. M. S. *HAWKE* AND R. M. S. *OLYMPIC*.

By Lieutenant W. C. Nixon, U. S. Navy.

a matter of general interest to the service at large, and as ditional note to the lecture delivered before the School of e Engineering by Mr. Sydney A. Reeve on the "Hydraulic ction Between Ships," I have prepared the following notes collision between H. M. S. *Hawke* and R. M. S. *Olympic*, ptember 20, 1911, off Cowes, Isle of Wight.

se notes are the result of my personal observations while a ger on the Olympic, and cover the situation from its earliest to the actual collision, I having had an excellent opportunity tching the accident from a position on the starboard side of omenade deck of the *Olympic*.

the time of his lecture, Mr. Reeve's statements were to me or less startling and revolutionary, as I believe they were to all those officers who heard them. Prior to this lecture, in on with many officers to whom I have since talked, I had a impression that "suction," as a term used to account for teraction between passing ships, was purely a propeller "suc- To a certain extent, I had frequently observed such inter- between small vessels, such as torpedo boats and destroyers, ad learned that under certain conditions such action must be ted and allowed for, but I had always accounted for it by such terms as "shallow water," "high speed," "suction," etc. ome five months following the date of the lecture, no oppor- of further observation presented itself, but when the situa- rose between the *Hawke* and the *Olympic*, it was instantly ent that it was one of the rare examples of the "ideal" case ed by Mr. Reeve; and following his system of reasoning I ble to anticipate nearly all phases of the collision.

I came up on the starboard side of the promenade deck of the *Olympic* at the instant when she blew two blasts on her whistle, to indicate her turn into the channel leading to the left of the Isle of Wight. The situation at this moment is indicated in the sketch marked Fig. 1, on opposite page.

Olympic following the channel from Southampton Water to sea, about ½ to 1 mile from the intersection of this channel with the one from the Solent. At this intersection the two channels unite into the main channel past the Isle of Wight. Upon her arrival at the point of intersection, the *Olympic* must make approximately a six point turn to port.

Hawke coming up the channel from the Solent, about the same distance from the intersection as the *Olympic*, and rather more than that from the *Olympic* herself.

Speed.—While it is difficult for me to judge the speed of the *Olympic* on account of the height of her decks above the water, all circumstances, such as time and distance from the dock at Southampton, speed with which objects passed, and the sound of the engines, lead me to believe that the *Olympic* was making at least 15 knots and probably her speed was nearer 18 knots.

It is worthy of mention that the usual course of liners leaving Southampton for Cherbourg is to pass to the starboard side of the Isle of Wight, that is, to turn to the right at the junction of the channels from the Solent and Southampton Water, and to pass to sea through the Solent. Hence there may have been some confusion in the mind of the captain of the *Hawke* as to the exact meaning of the Olympic's two blasts.

While in this situation the *Olympic* blew two blasts, and as far as I could learn held her speed. I am not certain whether the *Hawke* paid any attention or made any acknowledgment to these blasts, and apparently she too was holding her speed. As both vessels approached the main channel, it was evident that the *Olympic* would turn first by a slight margin, and as the *Hawke* kept coming on I recall wondering if her commanding officer understood "suction" and appreciated the danger he was running into. While yet a quarter of a mile away, however, the *Hawke* slowed (I estimate this from the disappearance of her bow wave), and fell in behind the *Olympic*. The situation at this time is

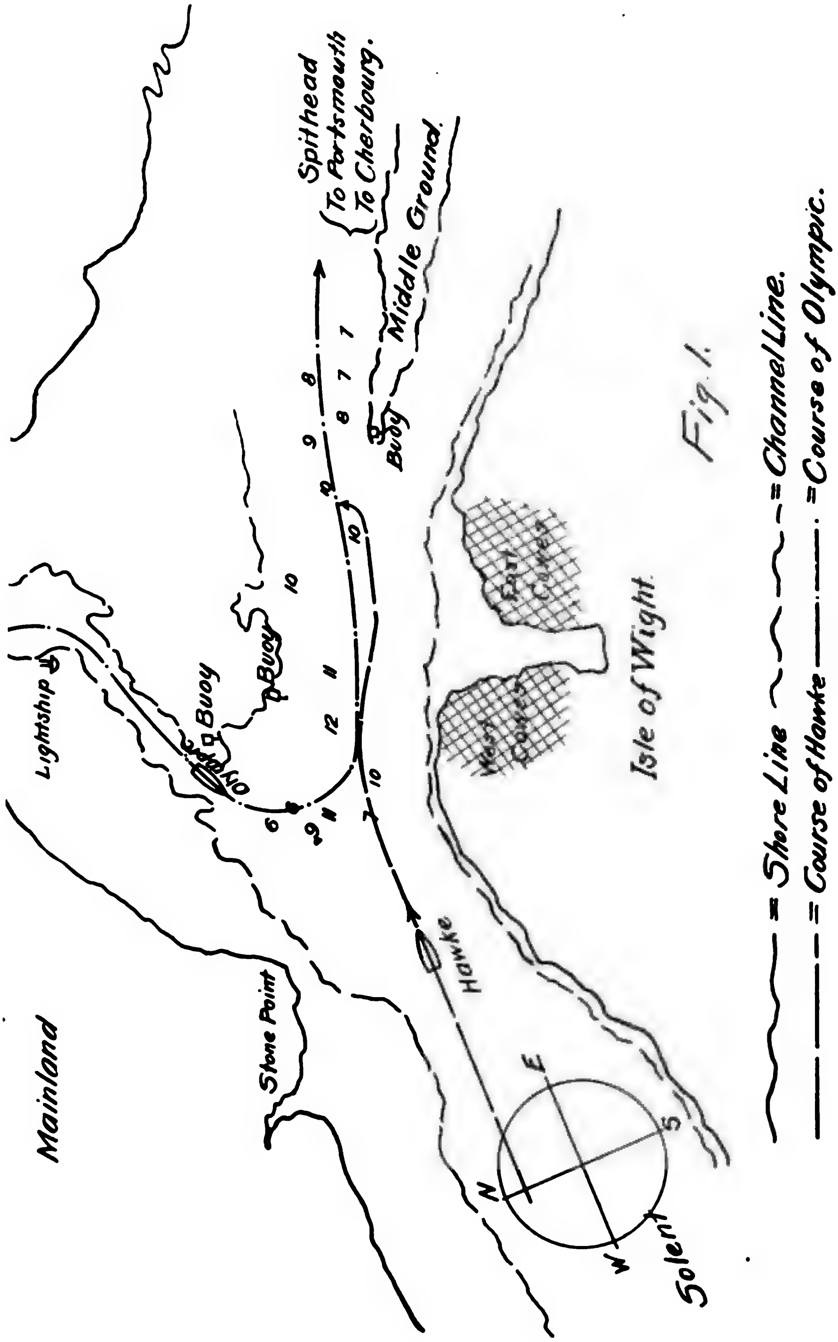

Mainland
Stone Point
Lightship
Buoy
Buoy
Olympic
Hawke
Spithead
To Portsmouth
To Cherbourg.
Middle Ground.
Buoy
West Cowes
East Cowes
Isle of Wight.
Solent
N
E
S
W
Fig. 1.
= Shore Line
= Channel Line.
= Course of Hawke
= Course of Olympic.

FIG. 1.

roughly indicated in Fig. 2. Believing that the danger of collision was gone, I passed on around the bow to the port side of the *Olympic*.

Perhaps three to five minutes later I crossed again to the starboard side and was surprised to find the *Hawke* in the position indicated in Fig. 3. The *Olympic* had completed her turn and had straightened on her new course. The *Hawke* was coming up fast, on a parallel course, perhaps 100 to 200 yards from the *Olympic,* and just beginning to "lap" her. It was nearly the instant when Mr. Reeve mentions that a shear "out" can be expected on the passing ship, and when a few seconds later I saw

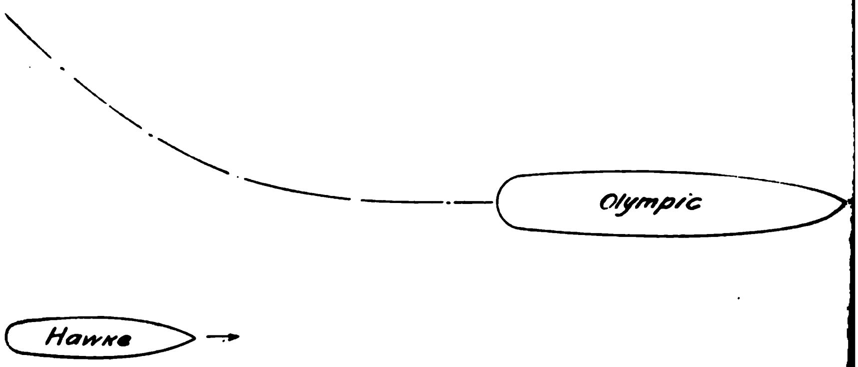


FIG. 2.

what I thought was this "shear out," I remarked to a person to whom I was talking "we will be hit in a minute." A few seconds afterward the *Hawke* swung almost instantly, pivoting apparently on her center, and seemed to leap out of the water toward the *Olympic*. She struck the *Olympic* almost exactly at right angles, at a point about 75 feet forward of the *Olympic's* stern. These later situations are indicated in Figs. 3 and 4.

Two points are to be noted here:

(a) The *Hawke seemed* to very appreciably *increase* her speed in the last few seconds before the actual impact.

(b) Although I know nothing of the *Hawke's* turning circle she got around to an eight point change of course in an incredibly short time, and I do not think she could have made as sharp a turn had she been using her engines.

In such a collision it is instinctive to look for white churned water at the ramming vessel's stern, but I am positive that the *Hawke's* engines were either not going astern at the instant of collision, or else they were barely started astern. This may be accepted as a proof of the quickness of the turn from the parallel course; in other

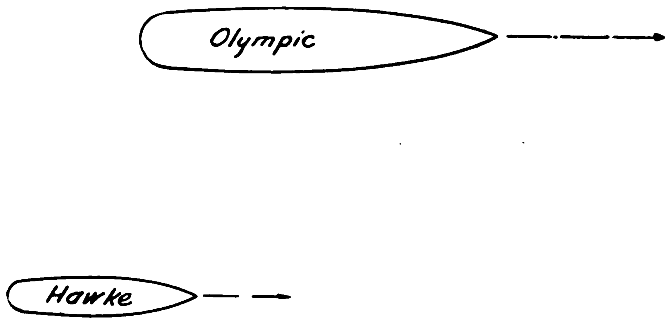


FIG. 3.—*Hawke* beginning to lap *Olympic*. Water shoaling rapidly due to influence of middle ground, see Fig. 1.

words, the time from what seemed safety to actual impact was too short to permit of the reversing of the *Hawke's* engines.

On board the *Olympic* nothing was done either with helm or engines. There would have been no time to do anything had the

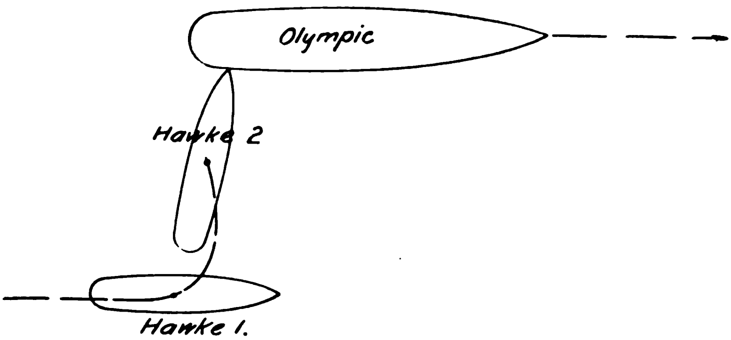


FIG. 4.

attempt been made. However, I doubt greatly that anyone on the *Olympic's* bridge had the slighest warning of the collision until the instant of actual impact. View aft from the *Olympic's* bridge is not good, and her officers must have been busy with her navigation down the channel. Further they would have had no rea-

son, *without a clear understanding of the principles of interaction between ships*, to pay any attention to the *Hawke*, she being in all respects " an overtaking ship " under the rules of the road.

I am unable to state whether the *Hawke* made any passing signals before attempting to overtake the *Olympic*, but as no answer was made by the *Olympic*, I assume that she did not.

So far as I could learn, the channel depth was from seven to eight fathoms, and the *Olympic* was drawing from 37 to 38 feet.

To recapitulate:

(a) At the situation shown in Fig. 1, the *Hawke* clearly has the right-of-way over the *Olympic*.

(b) However, the *Hawke* slowed, allowing the *Olympic* to turn into the channel ahead of her, and thus temporarily cleared the situation by following into a safe position astern, or rather, astern and to starboard of the *Olympic*.

(c) That the Hawke only again put herself in a dangerous position by later increasing her speed in an attempt to pass the *Olympic*.

(d) That after a certain point the situation then became an ideal case of what Mr. Reeve so clearly explains, and that from that point on results were in entire accord with theory.

Since the collision between the *Hawke* and the *Olympic* was so typical of a situation which may now frequently arise, but which, because it has been so rare in the past, is not generally understood, I consider it most advisable to place before the service at large, without further delay, an explanation of the interaction between passing vessels.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

FLAG OFFICERS IN THE UNITED STATES NAVY.

By REAR-ADMIRAL A. C. DILLINGHAM, U. S. Navy.

In looking over the Navy Register (1911) it will be found that with the rear-admirals now (Sept. 13, 1911) on the active list, together with those captains who will become rear-admirals by September, 1917, there will be 51 rear-admirals available for flag duty in that period.

The following list, with dates of commissions as rear-admirals. and the length of time each will have to serve before retirement for age, is submitted as interesting in showing how far we have really progressed, with the present system of promotion, in getting flag officers who shall have time enough to serve as such before retirement, to guarantee a progressive policy in fleet.

No.	Date of commission.	Date of retirement.	Time available for flag duty before retirement.
1	4 July, 1908	30 Dec., 1911	3 mos.
2	11 July, 1908	17 Dec., 1911	3 mos.
3	30 Oct., 1908	10 May, 1912	8 mos.
4	30 Nov., 1909	13 Feb., 1913	1 yr. 5 mos.
5	4 Dec., 1909	15 June, 1913	1 yr. 9 mos.
6	27 Dec., 1909	10 May, 1914	2 yrs. 8 mos.
7	9 Jan., 1910	10 Oct., 1913	2 yrs. 1 mo.
8	20 Feb., 1910	7 June, 1912	9 mos.
9	11 Mar., 1910	27 Apr., 1912	7 mos
10	17 Mar., 1910	7 Oct., 1911	1 mos.
11	17 Nov., 1910	31 Mar., 1914	2 yrs. 6 mos.
12	4 May, 1910	10 July, 1914	2 yrs. 10 mos.
13	20 Oct., 1910	20 Mar., 1913	1 yr. 6 mos.
14	7 Nov., 1910	13 Feb., 1914	2 yrs. 5 mos.
15	14 Nov., 1910	10 Aug., 1916	4 yrs. 11 mos.
16	1 Jan., 1911	11 July, 1915	3 yrs. 10 mos.
17	29 Jan., 1911	16 Dec., 1916	5 yrs. 3 mos.
18	8 May, 1911	6 Aug., 1915	3 yrs. 11 mos.
19	19 May, 1911	15 Dec., 1914	3 yrs. 3 mos.

No.	Date of commission.	Date of retirement.	Time available for flag duty before retirement.
20	14 June, 1911	29 July, 1915	3 yrs. 10 mos.
21	13 July, 1911	7 Sept., 1915	4 yrs.
22	14 Sept., 1911	13 June, 1916	4 yrs. 9 mos.
23	17 Oct., 1911	19 June, 1915	3 yrs. 8 mos.
24	17 Oct., 1911	29 July, 1916	4 yrs. 9 mos.
25	27 Apr., 1912	7 Apr., 1917	5 yrs.
26	7 June, 1912	23 Nov., 1917	5 yrs. 5 mos.
27	13 Feb., 1913	26 Nov., 1915	1 yr. 9 mos.
28	26 Mar., 1913	5 May, 1915	2 yrs. 2 mos.
29	15 June, 1913	30 June, 1917	4 yrs.
30	13 Feb., 1914	1 Nov., 1917	2 yrs. 9 mos.
31	10 Mar., 1914	13 Aug., 1916	2 yrs. 5 mos.
32	10 July, 1914	8 Dec., 1918	4 yrs. 5 mos.
33	15 Dec., 1914	11 May, 1918	3 yrs. 5 mos.
34	15 Dec., 1914	12 Apr., 1918	3 yrs. 4 mos.
35	5 May, 1915	26 Oct., 1918	3 yrs. 5 mos.
36	19 June, 1915	30 July, 1917	2 yrs. 1 mo.
37	11 July, 1915	4 Apr., 1918	2 yrs. 9 mos.
38	29 July, 1915	5 July, 1916	11 mos.
39	6 Aug., 1915	28 Nov., 1916	1 yr. 3 mos.
40	7 Sept., 1915	20 Oct., 1917	2 yrs. 1 mo.
41	26 Nov., 1915	5 Oct., 1918	2 yrs. 11 mos.
42	13 June, 1916	7 Sept., 1919	3 yrs. 3 mos.
43	5 Feb., 1916	1 Sept., 1919	3 yrs. 2 mos.
44	10 Aug., 1916	1 Jan., 1920	3 yrs. 5 mos.
45	13 Aug., 1916	25 Sept., 1917	1 yr. 1 mo.
46	28 Nov., 1916	Apr., 1920	4 yrs.
47	16 Dec., 1916	14 Apr., 1918	1 yr. 4 mos.
48	17 Dec., 1916	25 Sept., 1917	9 mos.
49	7 Apr., 1917	18 Aug., 1920	3 yrs. 4 mos.
50	30 June, 1917	11 Aug., 1921	5 yrs. 2 mos.
51	30 July, 1917	11 Feb., 1919	1 yr. 7 mos.

It will be observed that most of the officers on this list who have any considerable time to serve as rear-admirals are now rear-admirals, or will be very soon commissioned as such, and for at least six years we are going to be without a sufficient number of flag officers, who will have enough time to serve as such before retirement for age, to meet the requirements of a progressive policy in the fleet.

I believe it to be a recognized deplorable fact that we are obliged to change the commander-in-chief too frequently, and this fact is the cause of our not getting beyond the preliminary stage in

battle tactics and preparedness for battle. A new commander-in-chief, with a new staff, does not begin where his predecessor left off, and this is a natural result of a lack of experience of our flag officers as such; the same may be said of the new staff. The new commander-in-chief may not have the confidence in the methods of his predecessor to proceed with them, and it is more than frequently the case that the new commander-in-chief feels in a way bound to make changes. I have seen this with two most excellent and conscientious commandants; the first pointed out all the good things that he had done, while shortly after, his relief, the new commandant, in showing me around his command said: "Why my predecessor did" such and such a thing "I do not know. I intend to pull it down and do" so and so.

A new commander-in-chief may not have the confidence in himself, when first taking command, to progress at once from where his predecessor left off, and nothing is more discouraging to the personnel of the fleet than to find retrograde from, or a cessation of, progress that had been going on. A commander-in-chief must exert his personality, and to such an extent as to have the entire confidence of the fleet in his ability.

What we need, it seems to me, is an organization that will allow a progressive fleet policy to be adhered to, whether the commander-in-chief has one or six years to serve before retirement, or whether he has had previous experience as commander-in-chief or not. How shall we accomplish this? In answering this question, I suggest the creation of a permanent general staff afloat, the commander-in-chief with this staff to be *out* of formation in time of peace, with a junior flag officer in command of *each* division of the fleet. A permanent general staff afloat presided over by the commander-in-chief, for the administration and conduct of the fleet.

The whole business of this staff, in general, should be to prepare the fleet to capture or destroy the vessels of an enemy which it is its duty to encounter, and, in particular, to prepare to capture or destroy the vessels of the most probable enemy of this era.

This staff should prepare and submit to the commander-in-chief all matters of training, drills, exercises and battle practice, and be prepared to lay before a new commander-in-chief the exact status of preparedness of the fleet for battle, with the view of having the policy of the fleet continue its purpose without interruption.

This staff should not change with the change of commander-in-chief but be as permanent as is possible, its members being detailed for an indefinite period—not less than two years—longer if possible.

This permanent general staff afloat should be composed of officers selected by the Secretary of the Navy as follows:

Chief of staff, with rank not below captain.
Engineer officer, with rank not below commander.
Gunnery officer, with rank not below commander.
Torpedo officer, with rank not below lieut.-commander.
Paymaster, with rank not below pay inspector.
Medical officer, with rank not below medical inspector.
Marine officer, with rank not below major.
Secretary, with rank not below lieutenant.

The commander-in-chief may select his personal staff, consisting of flag lieutenant, two aides and a secretary.

The staff of the commander-in-chief at present is of about the same composition as the staff suggested, but there is this important and vital difference between the two: the present staff changes with the commander-in-chief, whereas the staff suggested is to be permanent.

This permanent general staff afloat, coupled with a proper system of training flag officers, will insure, as far as is possible, a progressive fleet policy, and supply the fleet with flag officers who can meet the requirements of a battle fleet.

This method, or organization, should in no way interfere with the prerogatives of the commander-in-chief; he is always supreme. He presides over the staff, which is advisory, and its permanency should continue a policy in force.

In considering the above list it would seem that, for the purposes of the fleet, those officers with the longest time on the active list would be the coming men in fleet, but because an officer is a young man of his class is no guarantee that he is best for flag duty. These officers with the rest should be tried out; they should have the opportunity of showing whether or not they are fit. The selection of the commander-in-chief should be made for tried efficiency alone. It is possible that a good captain will make a good flag officer, but it does not follow. It is well known that certain officers develop a faculty for tactical work, that is very

strong and practical. The work at the War College has developed this fact, and there is no place better for such development than the War College, except it be in fleet. This is the function of the War College. The prime object of the War College is to prepare the flag officer for the very great responsibility he is obliged to assume in fleet, or better, it is the place where the flag officer may prepare himself for the serious business of war by taking advantage of the facilities offered by that institution, and for this reason it would be best if captains eligible for flag duty in the near future could attend the War College before going into fleet.

We seem to neglect the military side of our profession by ignoring the facilities offered by the War College. We are serving in a military profession in a non-military country, and such a condition demands, on the part of our officers, greater efforts to preserve the military character than would be necessary in a military country.

Foreign naval powers are paying great attention to the training of junior flag officers, with a view to being able to select the best to conduct the fleet in battle. These countries make a more serious matter of the great responsibilities which must rest upon the commander-in-chief in time of war than we appear to do, and it behooves us to take advantage of all our facilities for preparation, that we may be able to compete successfully in battle. No country has an institution offering such advantages for the study of war as our War College and it would seem very unwise on our part if we neglect or ignore these advantages. The theories and axioms of battle are gotten from naval history and the game board, but for the practical application of these theories and axioms in conducting his force against the force of an enemy, the flag officer must have practice afloat, and he needs every possible opportunity for such practice. The flag officer must have his training; it is the most important, most essential of all training, for what good results can we get from all other efforts for efficiency, if the leader fails?

To this end the junior flag officer should be detailed in fleet for one year, and during that time he should be given every opportunity to develop his aptitude for fleet command, by having as far as is possible, absolute responsibility for the preparedness of his division for battle, and by being pitted against an opposing force in battle drills under battle conditions.

Rear-admirals and captains who will become rear-admin the near future should be employed *only*, in fleet, at the War lege, on the general board, chief of the permanent general afloat or as aids to the Secretary of the Navy: no such c should be employed on shore, or any duty (excepting as pre or members of general courts), which has not to do with the paredness of the fleet for battle. The junior flag officers sl have had duty at the War College before going to fleet: should return to the War College or to duty on the general b unless the Secretary of the Navy should require their servic aids.

All other shore duty, such as navy yards, boards, perma courts, bureau, training stations, receiving ships, etc., shoul performed by those officers who by reason of their early retire for age will be of little or no use in fleet.

In submitting this article to the Institute, I invite discussic

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LATEST DEVELOPMENT IN CONDENSING SYSTEMS.*

By LIEUTENANT (J. G.) J. B. HOWELL, U. S. Navy.
Student Officer, School Marine Engineering.

If a condenser contained steam and no air, the vacuum would be governed by the mean temperature of the steam throughout the condenser, and an air pump would not be required. In practice, air exists in all steam condensers; its presence has the effect of retarding the condensation of the steam on the tube surface, and it has to be removed in a state of saturation with water vapor by an air pump.

When a condenser is at work and a stable condition has been established, the weight of air entering the condenser and leaving it in a given time is the same; but the ratio of air to steam in a reasonably air-tight system is so small that its effect is negligible. As the fluid passes through the condenser and is condensed, the ratio of air to steam increases rapidly, until at the air-pump suction the air forms a very considerable proportion of the mixture.

There is, as is well known, a definite relation between the temperature and the pressure of saturated steam at a given pressure; but there is also a definite and lower temperature corresponding to every proportion of air to steam in saturated air at every pressure; and for a given vacuum the fall in temperature of the gaseous mixture, which passes through a condenser and on to the air pump, changes with the ratio of air to steam in a perfectly definite manner.

As the steam passes through the condenser and becomes richer in air, the rate of transfer of heat from the steam to the circulating water is greatly reduced. Even with an air-pump capacity in proportion to the amount of air gaining access to a condenser,

* The information contained in this article was obtained from Professor R. L. Weighton, Mr. D. B. Morison and Mr. William Wier.

the efficiency of the condensing surface must be adversely affected by increased quantities of air passing through, because the opportunities for contact of the steam with the tube surface is greatly reduced. If the air-pump capacity is not increased in proportion to an increase in air leakage, the lower rows of tubes automatically become ineffective for condensing purposes, and this so reduces the effective surface that a decrease in the vacuum is required, and ensues in order to re-establish the necessary equilibrium.

The weight of air entering the condenser depends upon (1) the air leakage in the system at all parts subjected to a pressure below atmospheric, and (2) the proportion of air contained by the feed water when entering the boiler.

Fresh water carried in feed tanks for make-up contains at atmospheric pressure from 2 to 3½ volumes of air per 100 volumes of water. If this water is introduced into the condenser about 70 to 90 per cent of this air is driven off.

Broadly it may be said that in no type of condenser can the condensing capacity due to its dimensions be maintained, unless the air pump is sufficient to render all the tube surface available for condensing the steam; the air pump must in fact dominate the condenser under all conditions of normal air leakage.

All condensers should embody the following feature of design: maintenance of uniform flow at right angles, both to the axes of the tubes and to the falling streams of condensed steam water, the depth of the fall being determined by the area necessary for the flow of steam between the rows of tubes, and this depth is small relative to the length of flow from the steam inlet to the air outlet.

The scientific consideration of the problem of condensers has led the engineers of the present day to recognize the futility of using the old type of condenser, and the design of the "centraflo" type has resulted therefrom.

It is universally admitted that the flow of gases in the condenser must be unrestricted and that, above all things, the pressure at the bottom of the condenser must not be greater than the pressure at the top. The density of the vapor in the condenser is, of course, greater at the bottom than at the top, and assumes the form of layers of different densities.

With the old design of condensers these layers were spread out horizontally over a large area and consequently the thickness of

the various layers was not great. The air and water pumps would start their suction on the bottom layer, *i. e.*, the most dense one, and on the first part of the stroke the condensate would enter the pump; but this heavy layer would soon be pierced before complete removal and a less dense layer drawn into the pump. This, of course, reduced the removal capacity of the pump and consequently the efficiency was poor. By the simple means of making the bottom of the condenser adjacent to the suction into a V-shape, the layers were piled up vertically instead of being spread out horizontally and the pump took its suction from a uniform layer throughout the stroke.

Experiments were then carried on with regard to the flow of vapor using a condenser without baffles and comparing the results with same condenser fitted with baffles, the baffles were mounted on rods and could be put into action or taken out without stopping the operation of condensing.

As soon as they were brought into action the vacuum increased several inches without altering any other conditions of condensing plant. From this it was ascertained that the steam vapor followed the lines of least resistance, which were in this case the sides of the condenser, and that baffles were absolutely necessary to insure that the vapor would pass around the tubes.

The velocity of the steam being greatest upon entering the condenser and of comparatively small density, the tubes were spaced far apart at the top of the condenser and closer together as they approached the bottom to allow for the increase in density of the vapor.

From the consideration of these experiments the so-called "contraflo" condenser was designed and the results obtained were eminently satisfactory.

The next problem that confronted the engineer was to provide a satisfactory installation of pumps which would remove the vapor of condensation and at the same time reduce the weight of air in the condenser. The dual air-pump system met the requirement under normal conditions, but it was found that in cases where the air leak in the system was above the normal the efficiency of this system was small.

The "kinetic" and "bi-therm" systems were then designed to meet these abnormal conditions and are discussed later on.

From the results of the experimental work of these laboratories the following conditions are drawn:

(1) It is conducive to efficiency in a surface condenser that the water resulting from the condensation should be intercepted and removed from the condenser as soon as possible after it has been formed.

(2) The capacity should be a minimum consistent with the accommodation and with the necessary surface, and the design should be such as to receive a uniform flow of vapor throughout the condenser section.

(3) The condensing water should travel at a fairly high speed through the tubes, and it should enter at the bottom and leave at the top.

(4) With suitable condenser arrangements and a reasonably air-tight system, there is nothing gained in efficiency by the use of air pumps exceeding in capacity 0.7 of a cubic foot per pound of steam condensed up to a limit of close upon 29" vacuum.

(5) With proper design of condenser, the temperature of the condensing water at discharge point may be equal to or slightly higher than the temperature due to the vacuum. This holds true for vacuum up to 29".

(6) With suitable condensing design, the temperature of the hot well may be from 3° to 5° higher than the temperature due to the vacuum. This holds up to 29".

(7) With suitable design of condenser, and in conjunction with "dry" air pump, a condensation rate of at least 20 pounds of steam per square foot of surface per hour will be maintained in association with a vacuum 28½": and a quantity of condensing water equal to 24 times the feed water at an inlet temperature of 50° F.

There are three systems in present use to meet these requirements; the first is commonly known as the "dual air-pump" system. It is shown in Plate I and is self-explanatory. The second is the "kinetic" system and the third the "bi-therm" system, which is a compromise between the first and second.

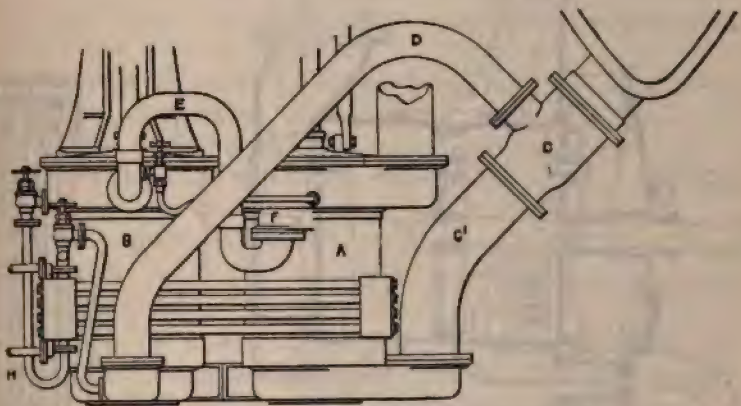
DUAL AIR-PUMP SYSTEM.

(Developed by G. and J. Wier Co.)

The dual air-pump system consists of a wet-air pump working at a temperature due to the vacuum in combination with a dry-air

pump working at a much lower temperature, on account of which it is enabled to handle air leakage without serious cooling of the main body of feed water.

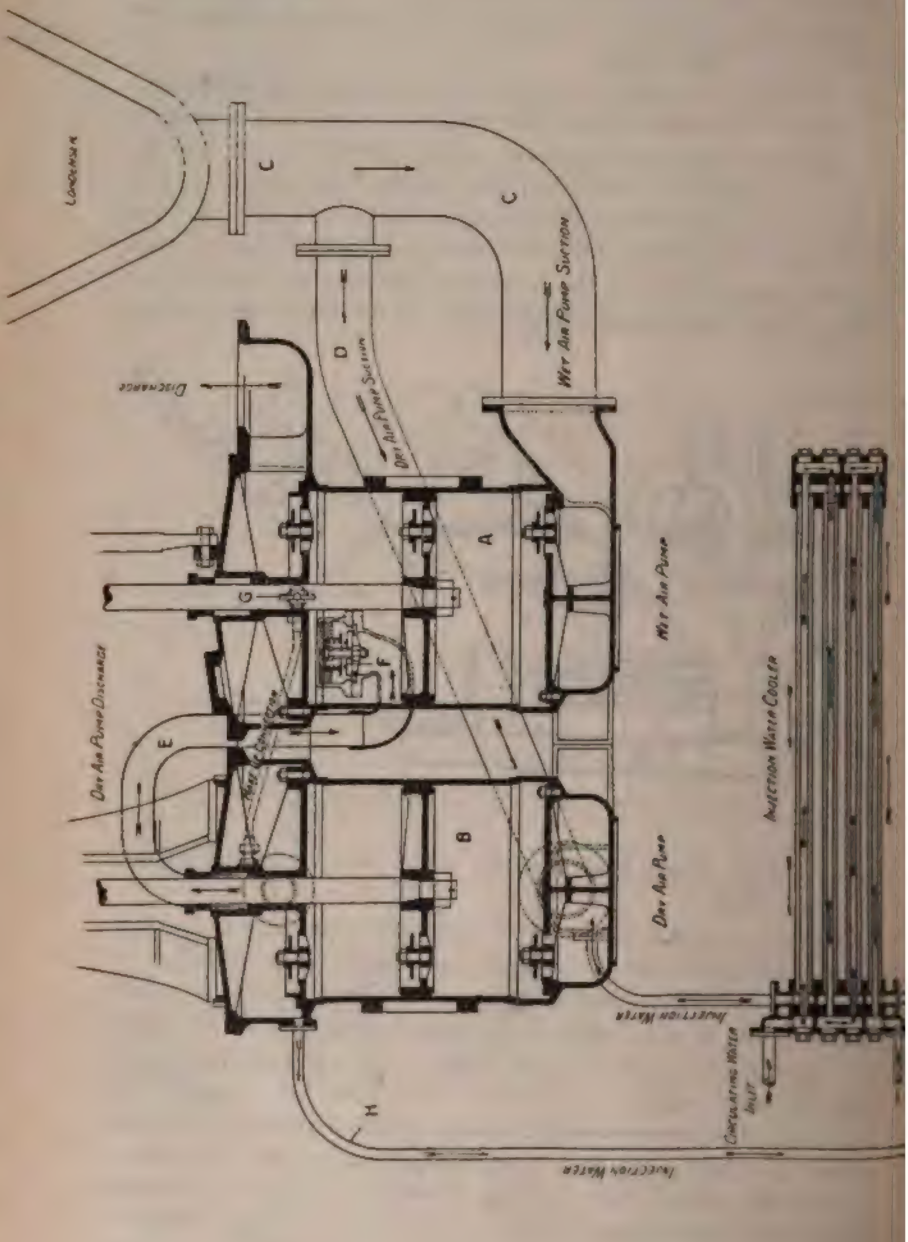
Referring to the diagram of the dual air-pump system, the wet-air pump *A* is situated below the steam cylinder, as this pump is the only one which works under considerable load; the dry-air pump *B* is driven by the beam links in the usual manner. One connection, *C*, is made to the condenser, but a branch pipe, *D*, is led to the dry-air pump, the connection being made in such a manner that the water from the condenser will pass by *C'* to the wet pump. Both the pumps are generally of the three-valve marine



WEIR PATENT "DUAL" AIR PUMP, COOLER AND CONNECTIONS.

type, but in certain cases the dry pump may be of the suction valveless type.

The dry-air pump discharges through the return pipe *E*, through a spring-loaded valve, *F*, into the wet pump at a point below its head valves. When starting the pump the filling-valve *G* is opened for a minute or so to enable the vacuum to draw in a water supply for priming from the hot-well pump. The valve is then closed and the water passes from the hot well of the dry pump by the pipe *H* to the annular cooler, through which a supply of cold sea water circulates, and after being cooled passes into the suction of the dry pump; then passing through the pump it becomes heated and again passes to the cooler, and so on in a continuous circuit, any excess passing over the pipe *E* to the wet pump. The


Condenser
C
C
Wet Air Pump Suction
D
Dry Air Pump Suction
Discharge
A
G
F
Wet Air Pump
Dry Air Pump Discharge
E
B
Dry Air Pump
Injection Water Cooler
Injection Water
Circulating Water Inlet
H
Injection Water

spring-loaded valve *F* is adjusted to maintain a vacuum of about 20" in the dry-pump hot well when the condenser is working at 28" vacuum, and this difference of 8" in vacuum is sufficient to overcome the friction in the cooler and pass the water into the suction.

THE KINETIC ROTARY AIR-PUMP SYSTEM.

(Developed by Mr. D. B. Morison.)

In the kinetic system the air and non-condensible gases are removed from the condenser by the action of a steam jet followed by a special system of water jets known as the " kinetic ejector."

Jets of water moving at a high velocity through suitably shaped orifices have been used for many years for the purpose of producing partial vacuum for various purposes, including the rarefication of the vapor space of condensers.

A water jet has of itself a relatively low capacity for assimilating and withdrawing air, and, therefore, should this type of air extractor be employed when the quantity of air to be removed is appreciable, then the quantity of water or the pressure necessary for the jet is large and the expenditure of power excessive.

The air-withdrawing capacity of any water jet device is, however, greatly increased if the air to be extracted is previously mixed with steam.

In case of the kinetic plant, steam is introduced into the air-suction pipe through a high-velocity nozzle, thus entraining the air and intimately mixing with it. This steam is condensed on the secondary sprays of the kinetic ejectors, and the resulting liquid carries with it all occluded air and gases which are ejected to the atmosphere by the main water jet.

The steam jet is fed with live steam in the case of plants fitted with electrically-driven pumps, or with exhaust steam at a pressure of about 20 pounds above atmosphere, if this be available. The quantity of steam required varies according to the air leakage and size of plant, but from one-half to three-fourths of 1 per cent of the steam to be condensed may be taken as the average figure for installations of considerable dimensions.

The water for the kinetic jet is water of condensation which has already been removed from the condenser, and the whole of the latent heat contained in the steam used in the steam nozzle is absorbed by this water, which is subsequently discharged to the

feed tanks at a correspondingly higher temperature than when it left the condenser.

The water of condensation is withdrawn from the condenser and discharged against pressure of the atmosphere by the action of two pumps on the centrifugal type, known as the " head " and " pressure " pump, respectively. The " head " pump works under the pressure of the condenser both on the suction and the delivery sides, and is designed so that it will handle the required quantity of water with an extremely low head on the suction side of the pump. The water is discharged from this pump into a stand-pipe or receiver which provides a natural head of water on the inlet side of the " pressure " pump by which the water is finally ejected against atmospheric pressure. This arrangement makes it possible to place the pumps only a few inches below the level of the condenser bottom, and a perfectly regular discharge is maintained at all loads, the amount corresponding to the quantity of steam condensed.

The energy lost from the system in a normally-designed installation does not exceed 0.0003 of the energy developed by the total steam which is condensed.

The whole energy of the steam jet used to extract the air and drive the water-extraction pump is returned to the system, with the exception of

(a) The theoretical energy required for the extraction of water, and

(b) The theoretical energy required for the compression of the air against the atmospheric pressure.

The energy expended, but again recovered, takes the following form:

(a) Sensible heat in the steam jet.

(b) Latent heat in the steam jet.

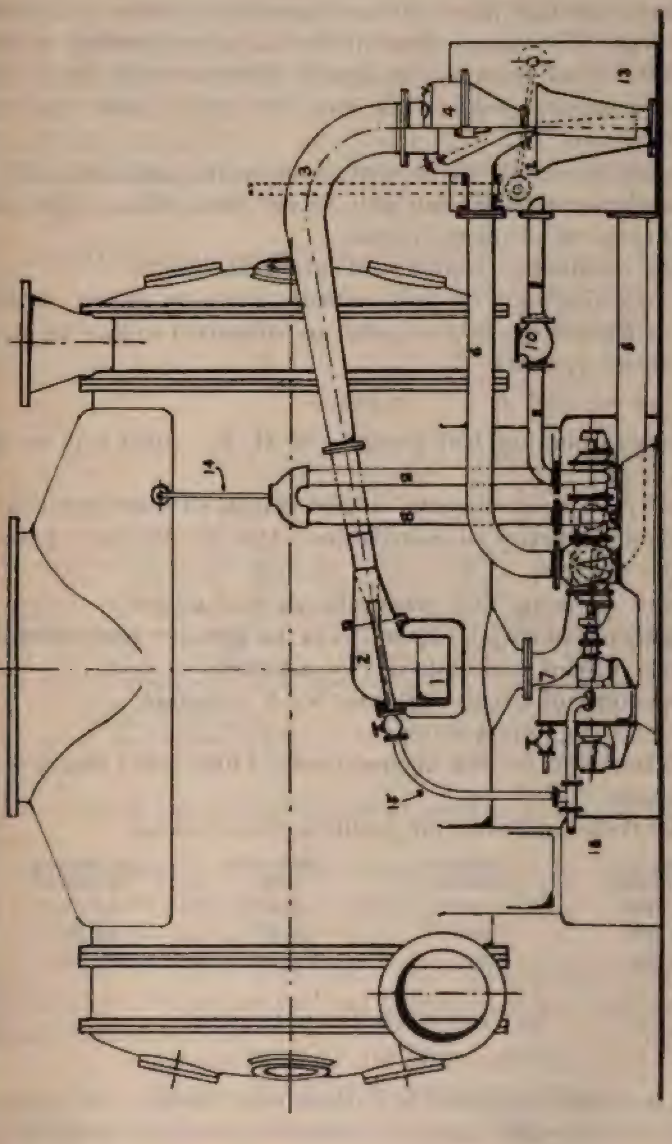
(c) A portion of the mechanical losses in the mechanism.

(d) A portion of the fluid frictional losses in the pumps.

(e) A portion of the energy used to produce the high-velocity air-extracting water jets.

EXPLANATION OF THE DIAGRAM.

Rarefication of the condenser is effected by steam jet (2), followed by the action of the kinetic ejector (4), supplied with water by the kinetic pump through pipe (5) and discharging into the kinetic tank (13).



1.—Air Suction Orifice on Condenser.
2.—Exhaust Steam Jet.
3.—Air Pipe to Kinetic Ejector.
4.—Kinetic Ejector.
5.—Suction Pipe to Kinetic Pump.
6.—Kinetic Pump Discharge Pipe.
7.—Condensed Water Pipe to Head Pump.
8.—Stand Pipe between Head and Pressure Pumps.
9.—Pressure Pump Discharge to Tank.
10.—Non-return Valve.
11.—Feed Water Delivery Pipe.
12.—Float Controlled Feed Delivery Valve.
13.—Kinetic Tank.
14.—Pressure Equalizing Pipe.
15.—Exhaust Steam to Jet.
16.—Surplus Exhaust Steam.

Water of condensation flows through pipe (7) into the head pump; thence through stand-pipe (8) to the pressure pump; and thence through pipe (9) and non-return valve (10) into kinetic tank. The excess water in the tank corresponding to the feed water is delivered by the kinetic pump through pipe (11) and float-controlled valve (12) into feed tank, which may be placed overhead.

The installation of this system occupies the same space and requires the same power, but only 52 per cent of the weight required in present air-pump systems.

Typical installation shown in diagramatic sketch.

The following data of tests, actually made by myself at the works of Richardson & Westgarth, are submitted to give an idea of the kinetic system.

PLANT.

Driving turbine for both pumps. 10 H. P.: 1900 r. p. m. to 2300 r. p. m.

Capacity of pumps normal. 10,000 pounds of water per hour.

Maximum capacity of installation. 1500 K. W. set. 30,000 lbs. water per hour.

Capacity of pump (1): 9000 gals. per hour, normal.

Capacity of pump (2): 12,000 to 14,000 gals. per hour, normal.

Temperature of feed tanks 90° F., constant.

Temperature of circulating water 60° F., constant.

The following tests were made:

Introduction of air leak in pipe, 1 mm., 2 mm. and 3 mm. holes successively.

Under these conditions the results were as follows:

Size of Air Leak.	Vacuum in Condenser.	Vacuum in Jet.	Jet Pressure in pounds.
1 mm.	29.82"	26.00"	15 lbs.
2 mm.	29.6"	26.5"	40 lbs.
3 mm.	29.3"	26.00"	80 lbs.

BI-THERM AIR-PUMP SYSTEM.

(Developed by Mr. D. B. Morison.)

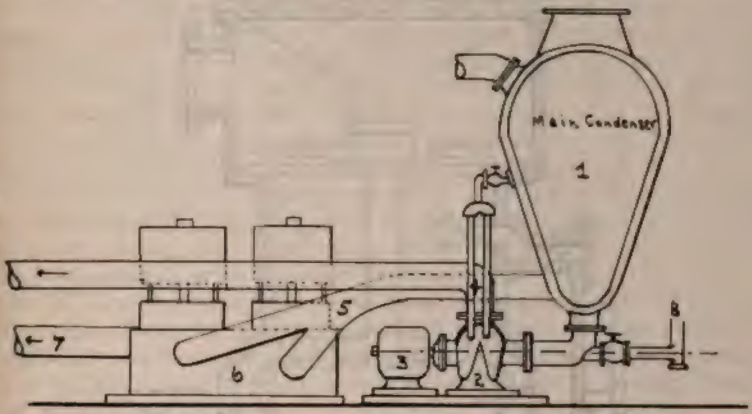
The bi-therm installation is a compromise between the present "dual" system and "kinetic" system and may be installed in connection with present designs.

The present form of air pump is used with the addition of a small centrifugal pump, steam or electrically driven.

The channels from the condenser are so arranged that the centrifugal pump removes the condensed water under normal conditions and the air pumps remove the air from the condenser. If the condensed water increases above normal the excess will go to one of the barrels of the double air pump, and if a further increase occurs then both air pumps and centrifugal pump will handle the condensate.

This combination not only increases the efficiency of the condensing plant, but at the same time affords three separate means of

DIAGRAMMATIC ILLUSTRATION OF CONDENSER WITH BI-THERM PUMPS.



1.—Main Condenser.
2.—Centrifugal Pump.
3.—Motor or Small Turbine.
4.—Discharge to Feed Tank.
5.—Suction to Air Pumps.
6.—Air Pumps.
7.—Discharge from Air Pumps.
8.—To Aux. Exhaust.

taking care of the vacuum in case of accident to any of the parts, namely:

(a) Combination of two air pumps and the centrifugal pump.
(b) One air pump and centrifugal pump.
(c) Both air pumps alone.

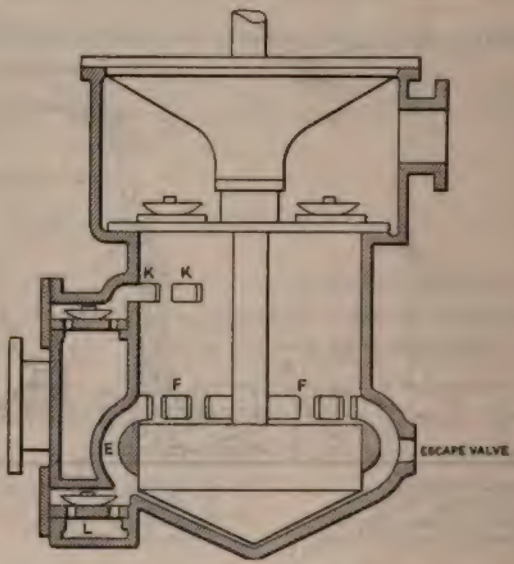
In addition to these advantages the reciprocating air pump will work under a steady normal load and the excessive wear on these pumps will be materially reduced.

DESCRIPTION OF THE BI-THERM PUMP.

Under normal conditions the centrifugal pump removes all the water of condensation, and the air pump works in a practically constant vacuum, which ensures steady action and less wear on the reciprocating parts.

An excellent form of air pump has been designed for use in connection with this installation and is essentially as follows:

On the down-stroke of the valveless bucket there is a diminution of pressure in the barrel above the bucket until the latter passes the air inlet ports *KK*, through which air is drawn into the barrel from the condenser, and continues to flow into it until the ports *FF* are uncovered. Meanwhile, the air and water which have been drawn from the condenser through the foot valves *L*



NEW AIR-PUMP DESIGN.

into the lower end of the pump during the previous up-stroke are, as soon as the bucket uncovers the ports *FF*, forced through the valveless passage *E* without shock and with minimum resistance and thereafter through the ports *FF* into the barrel above the bucket. Consequently, the bucket rises with a double charge, the design enabling a double-acting vacuum-producing effect to be efficiently obtained.

An escape valve is necessary when starting up the pump, unless it is previously drained, and in practice this valve discharges either back into the condenser or into the hot well above the head valves, both places being successful in practical use.

DISCUSSION.

Absence Over Leave in the Fleet.

CAPTAIN JOHN G. QUINBY, U. S. Navy.—The undersigned has read over with great interest the paper of Captain Fullam on the subject "Absence Over Leave in the Fleet," and during his seven years in the command grade has made a careful study of the subject discussed. He thoroughly agrees with the essayist in the statement that naval officers are to blame for not punishing with sufficient severity this offense. The lack of uniformity in the punishment for this offense awarded by different commanding officers is one strong reason for the continuance and prevalence of the offense. Men readily see and put their own interpretation on the lack of system shown in meeting this trouble. He also agrees with the essayist in his statement that if men are given to understand they must meet this condition fairly and squarely they will rise to the occasion and meet it.

In the earlier days of the careers of all the commanding officers now on the active list of the navy, the present standing for petty officers and others of inferior rating could never have been met. It was only after a petty officer was made a petty officer and given to understand his responsibility that the supply was met. Formerly the most inveterate drunkard in the ship, and probably the most prone to break his liberty, and who had the least sense of military discipline, was made a petty officer, only depending upon his dependability under the eyes of a commissioned or warrant officer, and his seamanlike qualities.

When the proposition was put to the seamen that American born men of good moral standing, correct habits, and a finer sense of military discipline were the *desiderata* for fulfilling the requirements of a petty officer, they rose to the occasion at once, with the result that now our chief petty officers particularly are men whose equals it would be hard to find in any walk of life.

The undersigned is fully justified in stating that we need have no fear of producing the necessary spirit in the enlisted personnel to effect such a condition of affairs that absence over leave will be a rarity, rather than, without a doubt, the most common offense every commanding officer in the navy faces.

As is usual in all reformations of a general far-reaching character, legislation is required to make "The punishment fit the crime." It is suggested that the following would be necessary:

To so extend the authority of Summary Courts-Martial that they could with the approval of the convening authority, sentence a habitual liberty breaker to three (3) months imprisonment at hard labor in a disciplinary camp, similar to that recently established at Port Royal, S. C., the confinement to take effect at once without reference to Washington after having been approved by the senior officer present; the man's pay to be stopped,

except the customary three dollars ($3.00) per month for necessary prison expenses; and the three (3) months to be automatically added to his term of enlistment.

By habitual liberty breaking referred to, it is meant such as offend in this manner three (3) times in any one calendar year. This of course would include men that we are sure exist, who break liberty repeatedly in order to get their discharge by a "Bad Conduct Discharge," and who are willing to have their character blackened by such a discharge in order to obtain their release from their voluntary entrance in the service.

Except for the above addition to the remedy suggested by the essayist, the writer has with singular consistency followed almost intuitively the method pursued by him, not, however, with the success he claims.

Many of the petty annoyances, such as delays at mustering in and out liberty parties, are no doubt responsible for much of the prevalence of this offense, and were steps taken by the Navy Department through general orders to avoid the delay in mustering in and out, and making the punishment for the first and second offense uniform throughout the service, save for the difference in the humanity of the several commanding officers who judge each case individually at the mast, the occurrence of these annoyances would become less prevalent, the effect would be instantly felt, and we could wait for the slower channels of Congressional action which would give us the rest of the remedy needed, that is, the necessary increase in the jurisdiction and authority of the Summary Courts-Martial.

The writer, while in command of the U. S. S. *Montana*, even with the authority vested in the commanding officer, met this delay by establishing a Special Fourth conduct class, which automatically gave a man the limit of punishment the commanding officer could inflict (deprivation of liberty for three months). This class was awarded to liberty breakers for the third offense in any one calendar year, and for one other offense, that of failing to take prophylactic treatment. It did not meet the required conditions, for as stated above, the writer does not claim the same success with the method as the essayist claims for the *Mississippi*. Could this have been made to fill the conditions prescribed in the necessary additions to the authority of the Summary Courts-Martial, the writer feels confident an equal or greater degree of success would have obtained. In all of this he supposes that the commanding officer in the daily police court at the mast listens with care and an insight bred from long experience to each case, inquiring into the merits of each offense; weighing the testimony of all witnesses the offender may bring, and then awarding suitable punishment.

CAPTAIN W. R. RUSH, U. S. Navy.—The essayist has written a timely and excellent paper. We must all agree with his findings and conclusions, and must all believe any captain indeed very fortunate who can attentively read this essay without mental groanings of *mea culpa*.

The *Mississippi*, however, stands not alone in the effort to combat the evil influence of no method at all; or of the many arbitrary methods of stopping liberty breaking which now prevail throughout the fleet; this can be demonstrated by referring to the records of the flagship *Connecticut*.

The punishment regulations adopted in the *Mississippi* for liberty breaking might have been copied from the ship's regulations of the *Connecticut*, so alike are they; and comparison with the good results obtained in the *Connecticut* shows them as good, and in some instances better than those obtained in the *Mississippi*. Of course, comparisons are odious, but when instanced for good and not for evil, and in the common cause of fleet efficiency, they may be pardoned.

The complement of the *Connecticut* includes 963 men, a considerably larger complement than other ships of the fleet; and during the past year 583 new men have joined the ship, so the *Connecticut* has not been spared in that particular.

As to the results accomplished: During a stay of three weeks at Weymouth, England, only 11 men overstayed liberty and 7 of these for a few hours only.

At Cherbourg from December 8th to 30th last, only 20 men overstayed liberty, and but 5 of these for more than 24 hours.

During the last visit of *Connecticut* to the navy yard, New York, the average daily absentee report was 6 men—nearly all repeaters.

The question of liberty breaking, and of the efficient checking of it on this ship, has received here more earnest consideration than any other matter affecting discipline, and the results in hand, as in the *Mississippi* have fully justified the means adopted.

In the case of *Connecticut* I would paraphrase the essayist on the last page of his article by saying, "It is proper to state in this connection that it has only been by the constant and unremitting personal attention of the *executive officer* that the plan has been a success."

This last page too is the meatiest page of any essay on fleet discipline that has ever appeared in print.

Il faut cultiver notre jardin.

CAPTAIN SPENCER S. WOOD, U. S. Navy.—I am heartily in accord with the views of Captain Fullam as expressed in his paper on "Absence Over Leave in the Fleet." The idea of uniformity in the matter of punishment is not a new one to me, as I suggested to the department in January, 1909, that a board be appointed to draw up a recognized schedule of punishments for offenses so that all ships may work along the same lines. It was also suggested then that this schedule should be elastic enough to admit of a commanding officer using his judgment. If a regular schedule is decided upon for the service, with highest and lowest limits clearly stated, it could be published in the ship's bulletin board and every one would then know just what is awaiting him for every infringement of the regulations.

It is believed that similarity of punishment for the same offense in different ships would do much to lessen the dissatisfaction which frequently exists in some ships with their officers.

The Department disapproved the suggestion, so the matter was dropped, but I have always believed that an upper and lower limit of punishment for the ordinary list of offenses is most desirable. With a well recognized punishment for absence over leave, which would be practically the same on

yet to apply this scheme to the large crew of a battleship; but in the *da* and in the *Celtic* it presented no difficulties and the co-operation paymasters was most cordial. The additional work involved cannot ne moment be weighed against the great material and moral gain.

ave never given any thought to the annoyance of delay in inspecting ending off the liberty-party. I thank the writer and shall bear it in

has been my experience that a man returning from liberty a few tes late is very often marked "on time." This encourages ideas the opposite of what we wish to instil. The punishment for returning time should consist of two parts: First, a fixed punishment for being second, a variable punishment depending on the amount overtime. , if a man is five minutes (or one minute) overtime, he would get hours' extra duty; if four hours overtime, he would get three hours twelve hours, or sixteen hours' extra duty, if for a first offense. This d take four days to work off, during which time he would necessarily no liberty. Saturday and sometimes Wednesday afternoons being ation periods, eight hours' extra duty can be worked off on those days. extra duty finished, there are no further restrictions as to liberty, so ien are always very zealous in putting it through.

ck courts and courts-martial should always inflict the entire maximum hment for this offense, leaving it to the revising authority to consider ating circumstances.

should be made very difficult to prove a valid excuse for returning ime. Late trains, delayed trolleys, blocks on the road, fog on the constitute a wonderful chapter of accidents at the mast if the captain ught to be easy. A "first offense" may also be pleaded several times, ded the offenses are not too near together, with bad results as to dis- e.

ave tried a method of suspended punishments. It depends for its ss upon never letting up—every breach of discipline involves the ment of its corresponding punishment; but the execution of this hment, in the case of minor offenses, may be suspended, and if the der has a clear record for three months thereafter, the report is wiped s record. To put this system into practice, each man must have a ct card made out when he is sentenced to his first punishment. On ard a complete record of all offenses and punishments is entered, and scanned by the captain when the man's case is being investigated at ast. Should a suspended sentence be hanging over him, its execution dered in addition to the new punishment. Forgiving or overlooking r offenses encourages them; this plan has exactly the opposite effect works well.

ptain Fullam is right. The lightness with which liberty breaking is ed in the service is a serious matter. It is one of the several dis- ary questions now to be considered. Others are the lack of smartness nergy with which so many of our young officers perform their duties in charge of the deck, especially in port; the lack of neatness and the ess appearance of our officers in uniform; the failure on the part of

men to salute officers, etc. The time has come to brace up. Is it possible that our work afloat has been a little too strenuous and our people, more especially the officers from lieutenant-commander down, have been worked a little too hard?

COMMANDER W. W. PHELPS, U. S. Navy.—Captain Fullam's observations on absence over leave in the fleet represent the tried experience of the one officer in the navy, who by constant study of the problem and fearless application of his own matured convictions is probably the best authority on the handling of men we have.

The handling and development of the men is the most neglected element of our navy. And it is inexcusable that it is so neglected, the personnel being the most important element of the navy.

I don't hesitate to say that our discipline is not good. The state of discipline is such that some men largely do as they like, not as they are told. We cannot say that discipline is good until we can say that all men *like* to do as they are *told*. Our imperfect discipline is reflected in many little things observed in the day's work. With an improvement in discipline will come a reduction of liberty breaking. To improve discipline, *organization* is the first step. There should be no detail of a ship's activity that is not made dignified and important by being *regulated*. The ship's regulations should be sane, everyone of them standardized to be applicable as near as may be to all conditions of winter and summer cruising. Then every one of them should be patiently and persistently enforced or else revoked. The same applies with even greater force to the navy regulations and the uniform regulations.

Thus the end will be that, throughout the day, every day, every activity of the men will be regulated by routine, and the men will be bred, unconsciously to themselves, into subordination, an understanding that they *must* obey, and a state of rest. These bring contentment. A regulated contentment brings a better morale. With a better morale there comes less liberty-breaking.

Where there is a regulation not enforced, no matter how trivial the particular, it works great harm, in that it is an example to the men (and to the officers) that you don't exactly mean what you say in such and such a case, and if you don't mean what you say in such and such a particular why perhaps you don't mean what you say in a lot of other regulations. Thus the man will unconsciously reason, and thus comes about a wide disregard of law, regulations and orders in general, and the commission of offenses purely because of lack of discipline.

With a thorough organization and sane ship's regulations covering all details, most minor reports and casual liberty breaking disappear from the mast, and there is left only malignant liberty breaking to be dealt with, and occasionally a case where the man "just took a chance" of violating some regulation of interior discipline.

Liquor on board ship has about disappeared. So has ship jumping where the liberty is frequent and well regulated.

I heartily agree with Captain Fullam that the Summary Court Martial punishment schedule is inadequate and does harm. An excellent principle

of discipline is to do all you can for the man who never requires punishment and come down hard on the man who demonstrates that he does.

With heavier penalties applied with discretion, there would be less summaries. We never make enough distinction between the man who never commits an offense and the man with the record smeared throughout the four years with offenses and punishments. Most of them seem to get "honorable discharges," testimonials of "fidelity and obedience," and in this view there is but little material incentive for a man to keep his record clear.

Each type of liberty breaker should get its own kind of treatment. I am not in sympathy with any ship's punishment schedule that gives, automatically and mechanically the same punishment for breaking liberty, let us say, to take the extreme, to the petty officer first class and the mess attendant. I think that each class of petty officers should be distinguished from the other classes of petty officers, and that more also should be demanded of C. S. C. men than of first enlistment men. All of this takes pains and thought and care, but the matter in my opinion merits the most painstaking study.

Liberty breakers can be assorted into the following types:

Type I—Casual liberty breakers.
Type II—Confirmed liberty breakers who are first enlistment men.
Type III—Confirmed liberty breakers who are C. S. C. clean sleevers.
Type IV—Confirmed liberty breakers who are C. S. C. petty officers.
Type V—Trained liberty breakers.

The Type I (casual liberty breakers) is generally to be found among the younger men. They may break liberty every few months, and usually are not absent over liberty many hours. They are not drinking men, so have not that excuse, but they break their liberty in cold blood from disregard of law, regulations and order in general, and because they learn to break liberty from older men. This type is intermixed with Type V, is a class of Type V. The records of this type show usually a string of minor delinquencies, for many of which the youngsters themselves are not to blame, but rather the slackness of the service discipline; and all the delinquencies of this type including liberty breaking will materially diminish if their morale is improved by attention to matters of ordinary ship's discipline. They are so young that they easily go wrong if not held strictly to an observance of all regulations, and they easily can be kept right under strict ship's breeding.

In this type will be found many youngsters of excellent stuff. These need only a strong hand over them and a manifestation of official interest in them and they can be moulded into man-o-warsmen of fine quality.

In this type also will be found the shiftless youngster who doesn't care whether school keeps or not, who lacks the element of self-respect essential in the process of breeding a well-disciplined man. These youngsters are the kind that works the navy for a soft thing, that kicks about the grub. Given an inch they go the limit, and are always to be found trying to do as they please, to wear any uniform they please, to smoke where they like, passing officers on shore without saluting and doing endless other insubor-

dinate things. Some of these can be pointed straight by a short course of vigorous disciplining. A few are hopelessly incorrigible and should be discharged as such, for their retention in any ship works endless harm.

This Type I, unless disciplined, eventually becomes Type III.

Type II, confirmed liberty breakers who are first enlistment men.

In this type are older men who enlist at the recruiting offices and then go to a guardo before being drafted to sea. In the guardo these men get no training worth calling as such; and when they arrive in the man-o-war they are nothing else but merchant sailors in a man-o-warsman's uniform. These men have thrown themselves into the navy as in an inebriate asylum and they should be thrown back into civil life when their unreliability is demonstrated. Those of this type of liberty breakers who are artificer petty officers have a bad demoralizing influence. It is this type, wearing the chevrons of a petty officer first class, we will say, with no training, with no idea of the responsibilities that ought to carry with the chevrons of a petty officer first class, with no idea of commanding a squad of men, it is this type that makes one sometimes think that we cheapen our petty officer ratings by being too promiscuous with them. Perhaps we could do better, reserve the petty officer ratings for the men who can be petty officers, and not give them for ability as specialists merely. Let us try more to breed our specialists *in the ship* rather than seek them from civil life.

Type III. This type, the confirmed liberty breakers who are C. S. C. clean sleevers, is bred from both the Type I men who re-enlist and the Type II men who never get to be petty officers. This type exists because of giving Type I and Type II liberty breakers "honorable discharges," "testimonials" with four months' pay. Some of this type are redeemable, but to redeem some it is necessary to treat them all with just severity, and to make an example to some by bad conduct discharging the worst. Those of this type who intend to stick to the service will respond to discipline. Those who don't intend to stick to the service are not amenable to any discipline, and the sooner we are rid of them the better, for while they are in the service they have a very bad influence over young men just from the training stations (or as these stations should more accurately be called, the Recruit Depots).

Type IV. Confirmed liberty breakers who are C. S. C. petty officers. This type is almost wholly derived from perpetuating by re-enlistment Type II liberty breakers. The tremendous demoralization and cheapening of the petty officers' chevrons wrought by this type is justified by the service because "they are good workers aboard ship." This antiquated service idea is found expressed in a very bad regulation, paragraph 8 of Article 1693, frequently invoked by revising authorities, whereby Summary Courts are admonished not to break a petty officer for "overstaying leave." Happily there is a tendency towards wiping out this wrong notion, for paragraph [illegible] (page 4) of Bureau of Navigation Circular of October 1, 1910, admits that liberty breaking is a bar to promotion. We should go farther. We should wipe out paragraph 8 of Article 1693 and break the petty officer who is a liberty breaker. And further, as fast as he keeps on breaking liberty he should keep on being broken even down to apprentice seaman, or and

passer or landsman. No rating must be allowed to be considered a vested right. To take away a man's stripes, to reduce him in the levels among his shipmates I regard as the severest and most convincing punishment, the one which will most surely bring about discipline. There are lots of fine youngsters ready and able and waiting to step up in the scale, and *reduction in rating* vigorously applied to the confirmed liberty breaker is the most potent of all punishments, of that I am convinced. I have no hesitation in saying that it should be applied to seamen and firemen first class where necessary to reach such men who are giving less than value received by reason of absences from duty on account of overstaying leave and the ensuing procedures. Reduce a few seamen to ordinary seamen and firemen first class to firemen second class and the Type I and Type III liberty reakers would sit up and take notice.

Type V. The *trained* liberty breakers. For this type the slackness of iscipline in the service is altogether to blame. To this type belong those oungsters who, having come into the fleet from the training stations well isciplined and with clear records and fine promise, actually are *trained* to reak liberty by association with and example of all the before-mentioned ypes of liberty breakers who are rather tolerated and accepted than corected and eradicated. Go to one's office and take down any number of ecords and one will see that this statement is correct. It is startling to ealize that there is at the training stations a discipline that keeps men's ecords clear, and in the fleet a lack of discipline that manifests itself by ad records.

While I have affirmed that the discipline is not good, I wish to be undertood to mean simply that more attention to elementary discipline would educe liberty breaking. I have the greatest faith in the possibility of naking our discipline superb, and I am a firm believer with Captain 'ullam that we can make our men what we will. We have so many plendid men in the service that it is a shame and a pity that we hang on o a few sots and unreliables only to degrade the great majority. Thereore I think that each of these types of liberty breakers should have its wn peculiar treatment, that the punishment a man merits should be based, ot on a schedule thought to fit all, but on a study of the *type* of liberty reaker one has to deal with. Undoubtedly the Summary Court punishnent schedule is ridiculously lenient, and its very leniency breeds more ummaries. The *laws,* that is, the statutes, are splendid. They provide mple and adequate punishment. But the regulations have gone too far in ying the hands of the captains in inflicting the *lawful* penalties. Under he *statutes* captains have full swing in penalties if they are permitted to nflict them. I say captains, because I take the ground that as the captain s responsible for the discipline, it is the duty of the Summary Court fficers to adjudge a punishment deemed appropriate by the captain, and s a Summary Court senior member I have always laid this view before he captain—that while the court would be guided by its *conscience* in the nding, it would be guided by the captain in its sentence. And so, under he law, the state of a ship's discipline reflects the character of the captain s a seaman and as a disciplinarian, and depends on his habits, tempera-

ment, personality, example and knowledge of men. While one scheme and schedule might be best for one ship under one captain, the same might not be so well applied in another ship under another captain. I agree, that as standards go, it were better could all ships standardize punishments, but that can not come about until we standardize captains; and I agree emphatically that we need more disciplinarians in the service, and a more vigorous application of the law. But on the other hand, the very limitations imposed by the regulations in applying the lawful penalties have probably operated to stifle some captains in attaining good discipline; for if these regulation limitations are good, why did not the splendid seamen who wrote the laws into the statute books a couple of generations ago put them in the laws? Probably because they knew that as the captain should be the "priest, prophet and king" to his men, so on the captain ultimately depends the discipline of his command, and the amount of liberty breaking.

LIEUT.-COMMANDER W. T. CLUVERIUS, U. S. Navy.—I am glad to see Captain Fullam's opportune article. It is high time that this ingrowing evil be eradicated, for absence over leave in the battleship fleet is malignant. Its influence is far-reaching, for it not only attacks discipline and creates disregard for authority, but imposes restrictions upon the scope of endeavor of the ship, the division, and the fleet. Captain Fullam has brought this point out, and not one whit too forcibly. The conditions are recognizable to all of us. Nothing exasperates one more than having to get work done with a chronic set of liberty breakers to do it. What is there to prevent other factors of unreliability from entering into the make-up of the ship's crew if this one so generally obtains, and who can forsee the effect of an unreliable personnel in action?

Captain Fullam says the offense prevails through lack of determined effort to stop it. Concerted determined effort, I would say. His paper is timely, because this is the day of standardization, and the handling of liberty breaking is bound to be standardized, and I am convinced that this will result in its sensible reduction. If determined effort will stamp it out in one ship, concerted determined effort will remove it from the fleet.

Captain Fullam presents a method. It is based on his analysis of the cause and spread of the offense. His method works. I have seen it operating under all varieties of conditions, and with all sorts of men. I have never seen a ship's company return to duty in better trim of mind and body than the *Mississippi's*, or tackle the day's work more cheerfully, or stick to it better, with liberty neither present nor prospective. Records can show a good deal of this, and it is my belief that this ship has been a "happy" one, which means much. I saw the method applied to a battleship in reserve, with a crew of 400, and acting also as a receiving ship. A large number were new men being broken in for battleships and destroyers about to be commissioned. There were many general detail men, drifting in and out, and her own skeleton crew made up the complement. This heterogeneous assortment had no initial interest in this particular ship. That the liberal liberty given was appreciated and was recognized as a privilege was plainly indicated, for the daily reports rarely showed more

than one absentee. The plan was taken up later by a gunboat cruising under the uncertain conditions of duty in the West Indies and marked success resulted.

The proposition is a square one. It is not necessarily new, and it is met more than half way. That a definite punishment attends abuse of its liberal features is well understood. It is productive of a good return of labor, for the enlisted man soon grasps the fact that "he must be on his job to hold it."

LIEUT.-COMMANDER D. W. KNOX, U. S. Navy.—Referring to the advance copy of an article entitled "Absence Over Leave in the Fleet," by Captain W. F. Fullam, U. S. Navy, received by me with the request for a discussion, the following is submitted:

1. The author's analysis of the *bad effects* of liberty breaking, striking as it does at the fundamental principles of duty, is extremely clever and carries conviction.

2. The article will undoubtedly do a great deal of good towards making the service at large appreciate the seriousness of the offense, which, it is believed, has not heretofore been thoroughly recognized.

3. The principle of the "free gangway" is undoubtedly sound, as well as that of severe punishment for transgression against liberal privilege.

4. But it should be remembered that the true origin of liberty breaking is debauchery. This latter is fostered by the "feast and famine" methods of work and play, which, though not as acute as formerly, still obtain to an undue degree.

5. Our first enlistment men are fine raw material and rigid effort should be directed towards making decency a habit easily to be acquired by them. Unfortunately we are well stocked with debauchees. Those who find great gratification in the large number of re-enlistments do not take into account the fact that a large proportion of these men could not hold a job in the Pennsylvania railroad because of their habits. We refrain from drastic weeding out of habitual liberty breakers (who are debauchees whether or not it shows on their record), because of the tremendous demand it would make on a recruiting service already strained to the limit.

6. While the remedy for liberty breaking practiced by Captain Fullam tends to reduce debauchery, it does not, in my opinion, strike sufficiently deeply into the root of the evil to promise permanently satisfactory results.

It aims only at making the best of a bad condition, whereas the correction of the condition itself is preferable. "Free gangways" and "severe punishments" are but incidentals in a more comprehensive reform which will be suggested by a closer examination into the *causes* of our troubles than is made in the article under discussion.

7. At present we are chiefly deficient in morale, which has been defined as "cheerful willingness to do the utmost." It is probably three times as essential to war efficiency as proficiency in the manipulation of material, to which of late years we have been giving such paramount attention.

8. Morale is based on contentment. Other factors, such as interest, enthusiasm, subordination and loyalty must be included in its definition;

but these cannot reach a high development unless thoroughly fertilized by contentment, which does not now exist to the proper degree among officers or men.

9. In order to secure reasonable contentment, it is vital that the administration of the service be such as to permit the personnel afloat to lead more normal and regular lives; comparable to that led by the average good citizen on shore. While it is unnecessary and perhaps undesirable to unduly encourage matrimony for the enlisted personnel, at the same time it must be recognized that of those who are the most worthy and the most valuable to the service, the major portion will sometime in the natural order of events desire to marry. They are then forced to choose between leaving the service or leading a very abnormal life. But whether or not a man marries, his contentment and his moral inclinations are fostered by regularity of life and by frequent substitutions of play for work and vice versa.

10. The remedy may be found in establishing a permanent "operating base" for each fleet within reasonable distance of one or more large cities, at which eight or nine months of every year will be spent. It may be observed incidentally that the British and Germans have followed this practice for a number of years.

11. The establishment of such a base would permit men and officers to settle their families or relatives permanently with a prospect of seeing them each week-end during most of the year. The three or four months each year away from the base may be employed in a foreign cruise or in such other work as may be desirable, with beneficial effect on the morale of "roving spirits," and without impairing that of men whose families are settled near the "base."

12. It is desirable though not essential that there be at such an "operating base" recreation grounds for all kinds of sport and athletics, billiard halls, reading rooms, etc., similar to those found at many British and German naval bases.

13. It is believed that the adoption of such a plan would strike at the very root of liberty breaking, debauchery, immorality, desertion of good men, failure of good men to re-enlist, the necessity for excessive recruiting, inadvisability of a more thorough weeding out of drunkards, lack of permanence of personnel, and many other difficulties which are encountered at present.

COMMANDER C. B. BRITTAIN, U. S. Navy.—Referring to the paper by Captain Fullam on the subject of liberty breaking and remedies for it, I consider the paper a most timely one, and the matter one that should receive the harmonious effort, not only of commanding officers, who working together, could do a great deal to remedy the evil, but this working together or united effort on their part should be brought about by well considered action of the Navy Department itself. This is perhaps the only way that united and consistent effort among captains could be brought about. Action by the Department regulating the monthly payment of men was an effort most successful and cured that evil which, only a few years ago, was perhaps the greatest of evils in causing discontent among the enlisted men and giving rise to breaches of discipline

born of this discontent. In May, 1910, when placed in command of the U. S. S. *Massachusetts*, I put into effect, as regards liberty breaking, a system practically identical with Captain Fullam's. It worked splendidly. In October of that year I further revised my system to make it more nearly identical with Captain Fullam's, which I had then learned about in some detail; the *Massachusetts* was then in reserve and the results were still excellent. When I took command of the *Wheeling* in January, 1911, I continued this same system, and in the eleven months that I have had command of the ship, liberty breaking has been an exception rather than the rule. The system not only adds to the efficiency of the ship and to the moral tone and self-respect of the personnel—commissioned as well as enlisted, for it hurts the pride and self-respect of everybody to see wholesale and uncondoned liberty breaking—but also adds to the contentment and real happiness of the men, for they, as well as the officers, like to belong to an efficient and well disciplined ship.

A New Method of Teaching Swimming, with a Few Hints on Rescuing the Drowning.

(SEE No. 139.)

MR. WILLARD C. TYLER.—This officer's amusing method of learning to swim in one lesson might well be tried by all who are unable to learn this easy accomplishment. His directions for breathing in rough water ought to be instinctive with everyone not a fool, but unhappily it is not. The advice is valuable to all inexperienced persons who find themselves in rough water.

In saving the drowning, an experience of the writer's should be of value to all who are called upon to assist these helpless people and may be the means of saving two lives, viz., the helper and the helped.

I have always been a strong swimmer, having learned as a boy in a Massachusetts fresh water river. Many years ago the duty fell to me to go to the assistance of a person drowning in about 20 feet of salt water. Through carelessness or the ignorant method of my approach this person got her arm tight around my neck, absolutely shutting off my wind, and our case was desperate. Everything went black and I felt that we both were lost. Just then an inspiration came to me, that a drowning person will not cling to a sinking object until the last death grip comes. It's contrary to all natural law. So I ceased all effort and we both went to the bottom. Just as my feet touched, to my unspeakable relief the grip around my neck was relaxed and we parted company. The rest was easy; I struck for the surface at sufficient angle to go clear, got some breath and, having more sense that time, got hold of one of the feet of the other person and towed her ashore, spread-eagled on her back, in safety. I was quite used up at the finish, but soon recovered my breath and was all right.

The point of the above is, that, if a drowning person gets too strong a grip on you, *and has not been down twice before, take them down, or to the bottom and they will let go.*

This is my belief from that experience and I would be glad to know if it is confirmed by others?

PROFESSIONAL NOTES.

Prepared by LIEUT.-COMMANDER W. B. WELLS, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rivadavia	28,000	Fore River Shipbl'dg Co.	Launched Aug. 26, 1911
Moreno	28,000	New York "	" Sept. 23, 1911

MORENO LAUNCHED FOR ARGENTINE NAVY.—The Agentine battleship *Moreno*, planned to be one of the most formidable *Dreadnoughts* in the world, was launched this afternoon from the yard of the New York Shipbuilding Company at Camden, N. J.

The keel of the ship was laid on July 9, 1910.

The only other vessel now afloat equal to the *Moreno* is her sister ship, the *Rivadavia*, recently launched by the Fore River Ship Building Company at Quincy, Mass. The *Moreno* represents the latest development of the 12-inch gun battleship. She is greater in point of length and displacement than the *Utah* and *Florida*, the largest ships in the American Navy.

According to the builders the *Moreno* and *Rivadavia* are even larger than the *New York*, the keel of which was recently laid in New York, and which will have a displacement of 27,000 tons. British designers are working to oustrip these vessels, planning the *Queen Mary* with a displacement of 29,000 tons.

The *Moreno* will carry twelve 12-inch guns. Her American peers in this respect are the *Arkansas*, built in Camden, and the *Wyoming*, constructed by the Cramps in Philadelphia, neither of which are yet in commission; the Austrian *Viribus Unitis*, the German *Thüringen*, the Japanese *Kawachi*, the Russian *Sevastopol*, the Brazilian *Sao Paulo*, the Italian *Dante Alighieri*, and the French *Courbet* and *Jean Bart*. The *Jean Bart* was launched September 22, 1911.

The next step forward in battleship building, so far as armament is concerned, is a reduction of two in the number of main guns, at the same time increasing the caliber to 14 inches. The *New York* will have ten 14-inch guns. A ship in the same class is under construction in Great Britain.

The speed of the *Moreno* will exceed vessels of her class which average 21 knots an hour. The *Moreno* under her contract, will have to reach 22½ knots. She is expected to develop 40,000 horse power. The engines of the *New York* are designed for 32,000.

The *Moreno* and *Rivadavia* are 595 feet long over all, while the *Utah* and *Florida* are 521½ feet. The Argentine ships have a breadth of 98 feet, and will have a normal draft of 27 feet.

The contract for the two ships was awarded to the Bethlehem Steel Company, which sublet the work of construction. The Bethlehem Company is supplying the armor and armament for both ships. Each battleship will cost about $12,000,000.

DIFFERENT TYPES OF TORPEDO-BOATS.—The Argentine government has let contracts to foreign shipyards for the construction of a certain number of torpedo-boats. These contracts have been divided among the French, German and English shipyards. It is to be noted that these boats are to be heterogeneous in their exterior design, following that of the shipyards in which they are to be built. Thus, in the French type, the keel line, which does not extend to the stern, curves upward suddenly, while the *Catamarca* and the *Jujuy*, built in Germany, have a keel line continuing horizontally to the stern. The design of the stern in the French type has the advantage of diminishing the resistance of the bottom, and consequently of affording a greater speed.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Radetsky	14,500	Trieste.	Under trial.
Zrinyi	14,500	"	Launched April 12, 1910.
Erzherzog Franz Ferdinand.	14,500	"	Under trial.
Viribus Unitis	20,000	"	Launched June 24, 1911.
V	20,000	"	"
VI	20,000	"	Contracted.
VII	20,000	Fiume.	"

CHILI.

A contract has been signed by the Chilian Minister with Messrs. Samuel White, of Cowes, for the construction of six new destroyers for the Chilian Government. The vessels will cost about £1,000,000.—*Shipping Illustrated.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Courbet	23,500	Lorient.	Launched Sept. 23, 1911.
Jean Bart	23,500	Brest	" Sept. 22, 1911.
France	23,500	St. Nazaire.	Authorized.
Paris	23,500	La Seyne.	"

SPEED OF BATTLESHIPS.—The 18,400-ton *Danton* and *Condorcet* and the 14,000-ton cruiser *Rousseau*, have arrived at Toulon, having accomplished the Brittany-Toulon run in 99 hours—34 hours at 17 knots and 65 at 16 knots. Although no attempt was made by Admiral de Lapeyrère to force his new ships or to establish a record, this voyage, accomplished under easy conditions, constitutes all the same a creditable performance and will help to confirm the high reputation which French battleships have enjoyed for steaming since the seven days' run at over 16 knots (Brest-New York, 1909) of the Le Pord division (*Liberté, Justice, Verité*). Battleships whose continuous sea speed is within two knots of their designed speed must be pronounced a success in the matter of steaming! The Parsons turbines gave entire satisfaction. The only unsatisfactory points mentioned

are the abnormal quantity of smoke produced by the five funnels (!) of the *Dantons* and the six funnels (!) of the *Rousseau*, and the rather heavy coal consumption, 357 tons per day for the *Dantons*, 363 for the *Condorcet*.—*The Naval and Military Record.*

THE FRENCH NAVY.—The French Naval estimates for 1912 have recently been submitted to the French Budget Commission. The outlay proposed for the year is 17,070,322*l.* The credits actually voted for 1911 amounted to 16,657,225*l.* The increase proposed for 1912 is, accordingly, 413,097*l.* The expenditure of 17,070,322*l.*, set against 1912 does not, however, include anything for the construction of the fifth and sixth ironclads, which, according to next year's French naval program, should be laid down during the year. If the program is adhered to as regards these two ironclads, a further outlay of 275,585*l.* will be required.—*Engineering*, October 13, 1911.

EFFICIENT GUNNERY.—Much satisfaction has been elicited in naval circles at the creditable performances the Deuxième and Troisième Escadres have achieved during their recent battle practice, against fixed targets, off the Hyères Islands. The high percentage of hits obtained (up to 57 per cent) testifies to the growing efficiency of fleet gunners, especially as the range, usually 6000 to 7500 meters, had been increased to over 8000 meters, in compliance with the instructions of Minister of Marine Delcassé, who aims at introducing gradually in the Gallic Navy the realistic and progressive methods of the British and American fleets. The test afforded an opportunity to compare together, from the point of view of battle efficiency, the Brest and Toulon squadrons, which were called to give a measure of their firing ability under conditions alike for both. As was to be expected, the Northern Escadre, used to training in the choppy waters of the Atlantic, had no difficulty in asserting its superiority over its southern rival, which is much wanting in sea practice, and has long had to spend its time between Toulon harbor and coastal cruises at economical speed (a course quite obligatory in these times of dear Welsh coal!) in the usually calm waters of the "Golfe de Lion."

The battleship *Justice* nearly beat with her big guns her record of [illegible] per cent hits (60 per cent during the first four minutes) of last year. Afterwards in order of merit come the battleships *Gaulois*, *Charlemagne*, *Démocratie* (that has long detained the gunnery cup), and *Jauréguiberry*. Of these six vessels, four belong to the Brest Squadron, a significant fact that has not escaped the attention of French naval men, who are more than ever, since the *Liberté* disaster, of opinion that the right and normal place for a fleet is at sea. Also the successful ships have all fine records to maintain, which points to strenuous work and to keen emulation among the personnel. It is obvious that the "gunnery fever," introduced by Admiral Germinet in the battle force, has not yet subsided, and the results obtained show what the Gallic fleet will achieve once it has better powder and has adopted the British custom of practicing under all conditions of weather. Very judiciously, Mons. Delcassé has decided to reward with promotions and distinctions the zeal and competence of the successful gunnery staffs.—*Naval and Military Record.*

SHIPBUILDING WORKS AT LA SEYNE.—The French shipbuilding firm which is known as Les Forges et Chantiers de la Mediterranée occupies, owing to the number and size of its shipbuilding slips and its up-to-date equipment, a foremost position among the French shipbuilding undertakings. It has establishments at La Seyne, Marseilles and Havre. That at La Seyne was founded in 1857, and in it shipbilding only is carried on. It, together with an engine works at Marseilles, is known as the South Works. The North-West Works at Havre include engine shops as well as a shipbuilding yard.

Both yards are equipped with facilities for the construction of ships of all sorts, from the small torpedo boat to the big battleship. Large numbers of vessels, both naval and mercantile, have been constructed in them for the Brazilian, Chilian, Greek, French, Japanese and Russian navies. Among the most important may be mentioned he two French battleships *Patrie* and *Justice* of 15,635 tons each.

The main establishment of the Forges et Chantiers de la Mediterranée is at La Seyne, and it is our intention to describe it alone in the present article. It covers 22 hectares (= 55 acres), with a frontage of 1200 m. (= 3940 feet) to Toulon roads. At the center of the yard is a fitting-out dock, 135 m. (= 443 feet) in length, and 35 m. (= 115 feet) in width, with a sufficient depth as to accommodate the largest ships which will be built for many years to come. The head and drawing offices are housed in a big building facing the fitting-out dock. The drawing office staff consists of no less than 150 men. There are seven slips, two of which have an available length of 200 m. (= 656 feet), and are built of masonry. Plates, beams, etc., are hoisted over the slips by powerful revolving electric cranes. The total covered area of the works is of 50,000 square meters (= 54,680 square yards), a noteworthy figure for a yard lying on the Mediterranean coast, where seasons are not severe. There are five main departments in this yard. They are as follows: The smith's, wood-working, artillery and armament, turbine and boiler departments.—*The Engineer.*

CHANGES IN THE FRENCH NAVAL COLLEGE.—There is now in progress a very important change in connection with the French Naval College, which is devoted to the training of naval officers. Interest is added to this change which, in the first instance, is one of locality, by the fact that it unquestionably paves the way for more considerable alteration, not only in the program of admission to the school, but especially in the education and training of officers, somewhat on the lines followed in various foreign countries.

It will be remembered that, prior to 1839, the school—or, to be more exact, the Royal College, which served to train the future naval officers—was situated in Angoulême, in the interior of the country. It is true that from 1827 the college was completed by a training-ship for pupils who were finishing their special studies, while towards the end of 1830 the naval school was installed, and up to the present time has remained, on board a vessel anchored in the roadstead of Brest. Various ships have succeeded each oher in thus affording shelter to the naval school and its pupils, and since 1841 the two vessels which have been assigned for his duty have successively taken the name of *Borda.* It is for this reason that in naval circles the school is known as "Borda." The ship which now accommodates the school—always in the roadstead of Brest, and always under the same conditions—is an old transport formerly called the *Intrepide* which was appointed to this service in 1889. Needless to say, the *Borda,* to call it by its generic name, in spite of the quiet which it enjoys in the sheltered roadstead of Brest, is becoming very old and decrepit, for, before being used for a naval school, it had done service as a transport. It is now forty years since it was first navigated.

It has therefore become absolutely essential to replace this vessel; which might be done either by substituting a new ship for this old *Intrepide,* or merely by installing the naval school elsewhere. The latter course is the one which has been decided upon, and the decision to abandon the classic ship anchored in the roadstead of Brest is due to Admiral Boué de Lapeyrère. Admiral Boué de Lapeyrère has brought to his Ministry a special knowledge bearing upon this question—he was formerly Maritime Prefect at

Brest—and he has been able to make clear the state of decay of the *Borda*, and the inconvenience which would result from continuing the naval school, in its enlarged, transformed, and improved state, in a boat which is necessarily too small for the requisite practical installations. It is certainly difficult to arrange on board a ship, be it what it may, for the commodious spaces required by the scientific and experimental education which it is now proposed to give to naval students. Moreover, where the pupils are numerous, hygiene is seriously sacrificed on board such a ship. In establishing a school on land, however, it is a simple matter so to construct new buildings that they are well adapted for their purposes, and afford the best conditions for health, as well as for the instruction of future officers.

Complete plans have now been prepared of the building about to be erected for the lodgment of the school and its pupils, and it is estimated that this building will be completed in two or three years, although it is probable, as almost invariably happens in such matters, there will be some delay. This naval college on land—a novelty for France—will be built on the rocky promontory which terminates the right bank of the River Penfeld, upon which is erected the naval arsenal of Brest. The plans of the new school have been based on the detail suggestions furnished by an officer who best understands the needs of the case; that is to say, by the present commander of the *Borda*, or naval school. The school will be built on an upland of about 4 hectares (10 acres), to which it is intended to annex a piece of land of about 10 hectares (24¼ acres), planted with trees. This latter will constitute a park for exercising the corps, and for promenades for the students, and will accordingly afford the best hygienic conditions. These two pieces of land, now to belong to the school, will be separated by the moat of the Brest fortifications, and the moat itself will be utilized for the purpose of games, to which adequate attention will be paid in the future scheme for the occupation of the students' time. The buildings will comprise three parts, one of which will be a large round pavilion, containing the dining-room, and overlooking the roadstead and the commercial port, etc. It will be possible, in this new school, to install all the requisites which hygiene demands—bath-rooms, shower-baths, lavatories and dressing-rooms, which could not, without difficulty, be provided in the holds and store-rooms of the old boat which now serves to lodge the naval officers' school. In the dormitories, according to present intention, the hammock, the old classic bed of the ships of former days, will be preserved. Large rooms containing models will be installed, together with chemical and physical laboratories, for the instruction of students, in order that they may become scientific and completely equipped officers. Modifications have already been introduced into the program of the naval school in the direction of making it more severe. The authorities even contemplate—although, in our opinion, this would be going too far as yet—changes in the program for the entrance examination; this program would approximate to that of the Polytechnic School, and would embrace a larger proportion of special mathematics. This kind of knowledge which has not always proved of special advantage to the mining and bridge engineers, and other functionaries, turned out by the Polytechnic school, would be dearly acquired if it interfered with the practical training of the naval officer of the future.

It is quite understood that while the future naval officers will be established on land, they will be kept in intimate contact with the sea and the ships, and with all practical applications. Having in view the advantage of practical studies, visits will be paid to the arsenal, which will be a near neighbor of the school, and these should prove very profitable, especially visits to armored vessels of every type, which either stay in or pass along the roadstead of Brest. The students will thus be able to acquire a precise knowledge of naval and military material in every form, whereas they could learn nothing of this in the old ship in which

they have been, and are at present lodged. They will be regularly required to maneuver a modern protected cruiser, no longer using for this purpose the old-fashioned despatch vessel, which they now move up and down the roadstead from time to time. Every three months they will go out to sea in the protected cruiser, and they will, in particular, navigate the waters of the Gulf of Gascony, where they will make acquaintance with a sea which is almost always disturbed, and also with a true sailor's life. Moreover, their practical maritime education will be completed by navigating and service in craft of all sorts, especially a certain number of torpedo-boats, which will be placed at their disposal. At the present time, in order to familiarize them with the sea and the officer's life, the students of the *Borda* are placed on an old transport called the *Dugay-Drouin*, in which, on leaving the school, they make a cruise, but in which there are no modern appliances. When the alterations to which we have referred have become effective, the students, their school training ended, will embark on a fine armored cruiser. This boat will probably be the *Jeanne d'Arc*, of 10,000 tons, capable of steaming 23 knots, with three engines developing collectively 28,000 horse-power. This boat, moreover, is provided with artillery in the turrets and casemates. It will constitute a school of practical application.

The students leaving the college to become officers will thus receive technical and military instruction which will correspond to the need of modern life, and the young officers will then be able to carry out certain duties from the moment they embark. It should be mentioned that even now, under the control of the present commander of the naval school—badly equipped as that school may be—the pupils have succeeded in getting into touch with modern practice in navigation. They have thus learned to manage torpedoes, and, in a recent inspection, the inspecting vice-admiral made an experimental trip to sea on a destroyer which was armed and equipped solely by the pupils of the naval school. All the duties on board were executed by the students, as well for maneuvering the craft as for working the engines and stoking, with the aid of coal-trimmers who were also no other than future officers. In this there is instruction of the most valuable kind, which should be enlarged and continued. The transformation of the French naval school, from the point of view of material, will undoubtedly bring about a modification in the training of future officers, and in the spirit which dominates their education. As in England, the United States, and Italy, the French naval authorities are seriously considering the abandonment of a system which places on board two sets of officers absolutely different, the one occupied with navigation and the means of combat, the other with the management of machinery. It is more than probable that, in view of the practical direction which will be given to the school on land, with its new laboratories and perfected means of study, a single body of naval officers will be established, who will unite all the special qualifications required in crews, as well those of mechanics and stokers, as those of combatants, boatmen, gunners, and torpedo-officers. Now there are, below the naval officer properly so described, men who are called "adjutants principaux," who have specialized in a particular trade—mechanic, gunner, or torpedo officer, and who, having "achieved" their rank, are capable of attending to certain details of which it is possible to relieve the naval officers. In this relation, the Minister of Marine has quite recently announced his intention to create a body of officers of the crews of fleets who will be concerned with part of the minor duties now required from officers properly so called, and who will have a position distinctly superior in authority and advantages to that of the present petty officers. We have here then, altogether, an assemblage of changes, some of which have already accomplished and appear likely to yield good results.—*Engineering*.

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Oldenburg	22,440	Danzig (Schichau).	Launched June 30, 1910.
Kaiser	24,000	Kiel (Kaiserliche W.).	" Mar. 22, 1911.
Friedrich der Grosse ..	20,000	Hamburg (Vulkan).	" June 10, 1911
Kaiserin	20,000	Kiel (Howaldt).	Building
König Albert	20,000	Danzig (Schichau).	"
Prince Regent Luitpold.	21,000?	Germania Works.	"
Ersatz K. Friedrich Wilhelm ...		... .	Authorized.
" Weissenburg..		....	"
" S		Wilhelmshaven.	"
Armored Cruisers.			
Goeben	22,600	"	Launched Mar. 28, 1911.
J	25,000	"	Building.
K	25,000	....	Authorized.
Protected Cruisers.			
Breslau	5,400 ?	Stettin (Vulkan).	Launched May 16, 1911.
Magdeburg	4,500 ?	Bremen (Weser).	" May 13, 1911.
Ersatz Cormoran	4,500 ?	Bremen (Weser).	" Nov. 4, 1911
" Strassburg ...	4,500 ?	Wilhelmshaven.	" Aug. 24, 1911.
" Seeadler	5,500	Germania Works.	Building.
" Geier	5,500	Howaldt.	"

THE KAISERIN, NEW WARSHIP, LAUNCHED.—Kiel, Saturday, November 12, 1911. The new battleship which replaces the old *Hagen* was launched today in the presence of Emperor William and Empress Augusta Victoria and christened the Kaiserin by Princess Victoria Louise.

Grand Admiral von Koester, who was second ranking officer in the international fleet assembled at New York for the Hudson-Fulton celebration in the fall of 1909, made the speech of the day.

The new warship, he said, was intended to help maintain an honorable peace, which was desired by the German nation, but should war come the *Kaiserin* would be found like Her Majesty's sons, who were always ready joyfully to offer their lives for the fatherland.

The *Helgoland*, which is the battleship of corresponding date to the *Moltke*, appears to be a very distinct improvement on the *Nassau* class, and possesses at first sight a much less cumbrous exterior appearance, more in keeping with that of a cruiser, unless she is seen end on, when the immense breadth becomes very striking. To the English eye the masts appear very light, but then the Germans accept bridge-level control platforms, and only signalling is necessary to arrange for.—*Engineering*.

GERMANY'S NEW DREADNOUGHT.—By the commissioning last August of the *Helgoland* Germany now possesses a *Dreadnought* squadron of seven battleships. The *Helgoland* is a sister ship of the *Thüringen* and *Ostfriesland*, and these, with the unfinished *Oldenburg*, form the class of super-*Dreadnoughts*. The *Helgoland* was laid down at the Howaldt yard, Kiel, in December, 1908, and launched in September, 1909, so that her construction period has been about 33 months. Her length is 546 feet, breadth 93 feet 6 inches, draft 26 feet 10¾ inches, and displacement 23,133 tons. She is propelled by triple-expansion reciprocating engines, calculated to give a speed of 20.5 knots. As compared with the earlier ships of the *Nassau* class the *Helgoland* displaces an additional 2000 tons. The armament is also heavier. The *Helgoland* carries twelve 12-inch (*Nassau* 11.1-inch) guns mounted in six turrets, fourteen 5.9-inch,

and fourteen guns of smaller caliber, along with six torpedo tubes. Usually she will carry 900 tons of coal, but the quantity can be increased to 3000 tons if necessary.

The German battlecruiser *Moltke*, which underwent her contract steam trial last week, is reported to have attained the record speed of 29½ knots, though for how many hours is not stated. This cruiser is a sister ship to the *Von der Tann*, and has been built by the same firm. She was laid down in April, 1909, launched one year later, and should be ready for service next month—a period of 29 months from the laying of the keel. The maximum speed of her sister ship is believed to be 28 knots, or a trifle less. It is given in the *Navy League Annual* as 27.63. The much higher speed stated to have been maintained by the *Moltke* can only be explained by the horse-power being in excess of that of the *Von der Tann*. In any case, it was a magnificent performance, and shows that the German engineers have nothing to learn from us. So the competition in horse-power goes on, and it involves an enormously increased outlay upon engines. We set the pace ourselves with our first *Dreadnought* cruisers, and now, presumably, we shall be compelled to produce armored cruisers of 30 knots. However much one may deplore this costly competition in engine design, England cannot afford to allow any rival Power to possess cruisers of superior speed, and for this reason the ensuing trial of the 70,000 horse-power cruiser *Lion* will possess more than ordinary interest.—*Naval and Military Gazette*.

The design of the cruiser *Moltke* has at last been published in Germany, though the details have been public property for a long time. The vessel carries eight twin turrets on the upper deck, disposed as in the *Von der Tann*, as well as the main deck turret aft, situated below the after center-line upper deck one, but for which the vessel would appear very similar to her predecessor. Although she also possesses only two funnels, she is confidently expected to exceed the 79,800 shaft horse-power of the *Von der Tann*. The length on the water line is stated to be 610 feet, which is some 70 feet less than that of the *Lion*, the displacement being 23,500 tons. A full water-line belt is formed and the midship armor is carried up to the upper deck, and covers the 6-inch gun battery of six guns a side. The vessel will proceed on trial during the next few weeks. —*Engineering*.

THE NAVAL PROGRAM.—Germany's Naval Program for the six months between October next and April, 1912, includes the following, says the Berlin correspondent of *The Globe*.

1. Ships to be ready on April 1 next: *Oldenburg* (battleship), *Goeben* (first-class armored cruiser), and *Breslau* (small armored cruiser). All three ships must be in a condition to perform their speed trials at that date.
2. Completion of the armament of the *Dreadnought* battleships *Kaiser* and *Friedrich der Grosse* and of the second-class cruisers *Magdeburg* and *Strassburg*.
3. Continuation of construction, for launching, of *Erzatz-Ægir*, *Ersatz-Odin*, and *Ersatz-Hagen* (battleship), and of *No. 1* (cruiser).
4. Laying down of battleship *S* and the two battleships to replace the *Kurfürst-Wilhelm* and the *Weissenburg*, the crusier *K*, two small cruisers, and an undetermined number of torpedo-boats and submarines.

CRUISER EXCEEDS 29 KNOTS.—A Reuter's telegram from Berlin says: While on her trials the new German cruiser *Moltke* attained a speed of 29.5 knots.

Berlin, September 9. "In all silence," as the German phrase runs, torpedo-nets have reappeared here, and if present plans hold good every large armored ship will be so fitted. The nets finally adopted, after

a long series of experiments, differ in many respects from the Bullivant variety, being lighter and, it is claimed, more rapidly handled. The four *Nassaus* have already donned their "crinolines," and a like equipment has been given to the three *Ostfrieslands*. It is worth noting that the nets have returned in the face of heated opposition from naval officers, and curious stories are heard of the aversion with which commanders view the innovation. They still maintain that torpedo-nets are a source of danger rather than protection, owing to the extreme likelihood of shell fire wrecking the apparatus and of its becoming involved in the propellors and rudder. These objections deserve consideration, coming as they do from progressive and practical seamen; but it is doubtful whether they will avail against the decision of the authorities.

THE BLÜCHER'S REPUTATION.—Some excellent steaming performances and a record of good behavior since her commission in the autumn of 1909 have done much to reconcile German public opinion to that product of a strange misunderstanding, the armored cruiser *Blücher*. So well, indeed, has this boat shaped under all conditions that in service circles it is doubted whether the Admiralty is well advised in contemplating, as it is reported to be, a change in the armament by substituting single 9.4-inch or even 11-inch guns for the double fore and aft 8.2-inch turrets. There can be no question that the vessel is structurally capable of carrying heavier weapons, since a certain margin of strength was allowed in the early stage of building, when the Admiralty was still undecided as to what armament should be put on board pending reliable particulars of the British *Invincibles*, which were then on the stocks. At the same time there is a well-grounded feeling that reconstruction, however slight, jeopardizes the speed and other qualities of a ship, and as the *Blücher* has acquitted herself so admirably hitherto, the advocates of leaving well alone may carry their point.

SHIPBUILDING RESOURCES.—Since the echoes of the agitation of 1909 died away little has been heard of acceleration of new construction in German yards, and yet it is a fact that the three battleships of the *Ostfriesland* class have all been commissioned well in advance of the official dates. According to a statement made some time ago by the Marine Administration, the *Helgoland* was due for commission on October 1 as the seventeenth battleship of the High Seas fleet. As a matter of fact, however, this vessel was commissioned on August 23. The *Thüringen* entered the service on July 1, and the *Ostfriesland* on August 1, both several weeks in advance of the dates forecasted. Germany is, of course, rather to be praised than blamed for this evidence of the efficiency of her shipbuilding establishments, particularly as their is every reason to believe that the official laying-down dates were adhered to. As a result of this energy the fleet which was reviewed by the Kaiser this week included seven *Dreadnoughts*. The moral attached to the circumstances is that the potentiality of German yards in the output of warships should not be under-estimated. They are undoubtedly in a position to drastically reduce the present average building period, and if the need arose they could press the best British yards very closely in point of rapid construction.

TYPES OF TURBINES.—The three turbine battleships authorized this year and for which contracts were recently placed, will each have different machinery installations. The *Ersatz K. Friedrich Wilhelm*, to be built at the Vulkan yard, Hamburg, will be driven by Allgemeine Elektricitäts-Gesellschaft turbines to be manufactured in the Vulcan workshops. Parsons turbines have been chosen for the battleship "*S*," building at Wilhelmshaven, though the type adopted in this case differs considerably from the original Parsons system, certain modifications which make for simplicity having been introduced. The batch of six large torpedo-boats constructing at the Krupp-Germania yard will have similar engines.

the case of the *Ersatz Weissenburg*, laid down at the Weser yard, a novelty will be introduced in the shape of turbines constructed by the Bergmann Elektrizitätswerken, of Berlin, for which a great economy in fuel consumption is claimed. Futhermore, the usual cruising turbines are rendered unnecessary. It is thus evident that the Marine Amt has no intention of resting on its oars in the matter of turbine development, albeit the wisdom of introducing so many divergent types of propelling machinery into the navy is open to question.—*Naval and Military Record.*

According to *Nauticus*, the battleships of the *Helgoland* class—*Helgoland, Ostfriesland, Thüringen* and *Oldenburg*—have a displacement of 22,800 tons, and an armament of twelve 12.2-inch, fourteen 5.9-inch, and fourteen 3.4-inch guns. The main armament of these vessels had long been known, or accurately surmised, but 6.7-inch had generally been assigned to the secondary battery. At one time there were, too, sketches in certain English papers, purporting to be drawn from visual evidence, showing four triple turrets. The guns, however, are arranged in the same manner as those of the *Nassau*.

The cruisers *Moltke* and *Goeben* are stated to displace 23,000 tons and to have a designed speed of 25.5 knots with 50,000 horse-power turbines. The armament is given as ten 11-inch, twelve 5.9-inch and twelve 3.4-inch, the arrangement being generally the same as in the *Von der Tann*, with an additional turret superposed forward of the aftermost. The disposition is thus almost identical with that in the *Hercules* and *Colossus*, six guns bearing ahead, eight astern, and ten on either beam.

Assuming the weight of the German 12.2-inch shell to be 981 pounds, of the 5.9-inch 112 pounds, and of the British 13.5-inch 1250 pounds, the following is the comparison between the *Colossus, Orion* and *Helgoland:*

	Colossus.		Orion.		Helgoland.	
	Guns.	Wt. of Fire.	Guns.	Wt. of Fire.	Guns.	Wt. of Fire.
		lbs.		lbs.		lbs.
Ahead.....	vi. 12-in.	5,100	iv. 13.5-in.	5,000	vi. 12.2-in.	5,886
Astern ...	viii. 12-in.	6,800	iv. 13.5-in.	5,000	vi. 12.2-in.	5,886
Broadside.	x. 12-in.	8,500	x. 13.5-in.	12,500	viii. 12.2-in.	7,848
All guns*.	x. 12-in. xvi. 4-in.	8,996	x. 13.5-in. xxiv. 4.0-in.	13,244	xii. 12.2-in. xiv. 5.9-in. xiv. 3.4-in.	13,676

* NOTE.—The number of 4-inch guns in the *Orion* is not certain.

For the corresponding battle-cruisers *Indefatigable, Lion,* and *Moltke*, the comparison is as follows:

	Indefatigable.		Lion.		Moltke.	
	Guns.	Wt. of fire.	Guns.	Wt. of fire.	Guns.	Wt. of fire.
		lbs.		lbs.		lbs.
head.........	vi. 12-in.	5,100	iv. 13.5-in.	5,000	vi. 11.0-in.	4,560
stern.........	vi. 12-in.	5,100	ii. 13.5-in.	2,500	viii. 11.0-in.	6,080
roadside.	viii. 12-in	6,800	viii. 12.5-in.	10,000	x. 11.0-in.	7,600
ll guns*.....	viii. 12-in. xvi. 4-in.	7,286	viii. 13.5-in. xxiv. 4.0-in.	10,744	x. 11.0-in. xii. 5.9-in. xii. 3.4-in.	9,232

* NOTE.—The number of 4-inch guns in the *Lion* is not certain.

—*United Service Magazine.*

NEW TORPEDO NET EQUIPMENT.—Berlin, October 7.—There is every reason to believe that the prejudice with which German naval men originally viewed the reintroduction of torpedo nets has been overcome to a great extent by the many qualities of the new apparatus. The nets are operated by an auxiliary engine more rapidly, it is said, than is possible by manual labor. Great strength is a feature of the material, which offers a stout resistance to any kind of cutting appliance. The net hangs in a double fold, being kept in place by an entirely new type of boom, so arranged as to keep the net in proper position even when the vessel is steaming at a fair rate. All technical details of this inovation are still a secret, but it is known to be giving complete satisfaction. The reappearance of net defence in German ships shows that the authorities have at length come to recognize that other Powers are paying great attention to the development of the torpedo as a weapon of offence. Hitherto there was reason to suppose that the Marine Office looked upon the torpedo as its own special possession, to be exploited to its utmost capacity as a means of cheaply reducing the battleship strength of an enemy superior in numbers. One heard constantly of "the bolt from the blue," in the shape of an audacious torpedo attack on some great base of the unsuspecting foe, a plan which presupposed no very great watchfulness on the part of the latter. At the same time, little was done to give German battleships themselves any protection against this form of assault, seemingly because it was thought they had nothing of the kind to fear. That Great Britain and France both had a huge flotilla of surface and submarine torpedo vessels which, it might be assumed, had not been built to rust in dockyards, was a circumstance of no importance. It looks as though saner councils have prevailed, however, as is demonstrated by the new net equipment. No doubt the ever increasing chances of the successful employment of torpedos by "capital ships" against "capital ships" were taken into consideration. Much that has been published on the torpedo armament of new German armored ships is open to question, but is is quite clear that progress has been made in this as in other branches.—*Naval and Military Record.*

THE FORTNIGHT IN GERMANY.—*Summary:* Grand maneuvers and naval review at Kiel. Promotion of admirals and conferring of honary distinctions. Trial trip of the armored cruiser *Moltke;* its characteristics. Order for the construction of the armored cruiser *K.* Views on the speech of M. Delcassé, French Minister of Marine. Berlin, August 15, 1911. The autumn maneuvers of the German fleet, which sailed on the twenty-eighth of August, began with exercises in the waters lying between the Bay of Kiel, the island of Fehmern, the east coast of Holstein and the southern coast of the Danish Islands. "The imposing spectacle of the departure of our fleet," says the *Localanzeiger,* the official organ of the government, "showed that we possess today a sea force that has no cause to fear an encounter in the open sea. The time has passed when our naval inferiority compelled us to adopt a conservative policy inconsistent with the dignity of a great power."

The naval review in the Bay of Kiel, which on Tuesday, September 5, concluded the maneuvers, was a brilliant justification of these proud words. On the morning of the 5th, the weather threatened to be unfavorable to the imposing spectacle to be enacted in the Bay of Kiel. The sun lay hidden behind dark gray clouds and a fine rain was falling so persistently that the worst might be expected. At nine o'clock, the Imperial yacht, *Hohenzollern,* with the Emperor, the Archduke Francis Ferdinand, and a brilliant retinu of German princes and German and Austrian admirals on board, got under way. At the same time the weather began to clear, when about ten o'clock the *Hohenzollern* reached the fleet, the sun shone down on the magnificent spectacle from a blue sky. The fleet came slowly into the gulf preceded by six flotillas comprising sixty-six modern destroyers. The squadron followed in column, led by the flag-

ship *Deutschland,* flying the flag of the commander-in-chief. Simultaneously with the flagship, battleships and cruisers saluted the Emperor with thirty-three guns. The fleet was shrouded with a thick, white smoke furroughed by jets of yellow-red fire. The smoke cleared and then came the great moment. The endless line of battleships filed majestically by the supreme chief of the fleet. First came the *Deutschland*, then the four *Nassaus*, nine cruisers of the *Schlesien* and *Braunschweig* class, the four armored cruisers, *Blücher, Von der Tann, Yorch* and *Roon*, four battleships of the *Kaiser* class, and the cruisers *Worth, Brandenburg* and *Schwaben*. Eight protected cruisers, all provided with turbines, the tenders *Blitz* and *Pfeil*, the division of mine sweepers, and the flotilla of submarines brought up the rear. All the ships were flying the German battle flag, and the Austrian colors in honor of the Archduke Francis Ferdinand. Of course, the all important fact of the naval review consists in the appearance of the first German squadron of *Dreadnoughts*, although the squadron cannot be considered complete without the super-*Dreadnoughts Thüringen, Ostfriesland* and *Helgoland*, which have not yet completed their trial trips. After the ships had filed past, the Emperor and Archduke, accompanied by the Austrian Admiral, Count de Montecucoli, went on board the *Deutschland*. The whole fleet then put out to sea where it maneuvered for several hours before the Emperor and his hosts. These maneuvers consisted in a series of tactical drills and a long battle drill between a squadron composed of seventeen of the most modern ships and an enemy represented by the reserve squadron and the armored cruisers. Breakfast was served by the commander of the fleet on board the *Deutschland* while the fleet was making for its rendezvous near the island of Fehmern. The Archduke and Count Contecucoh must have been enthusiastic over what they witnessed. After having passed the afternoon on board the *Hohenzollern*, the Emperor and his hosts went on board the *Deutschland* about seven o'clock in the evening. After the dinner, the *Deutschland* returned to Kiel. On the way a night combat took place, with an attack by the destroyer flotillas. The scene was one of wild and savage beauty. The Emperor's guests beheld spellbound the luminous cones of the projectors, the thick clouds of powder smoke, the signal rockets, the dark, roaring water, the outlines of the great ships and the black-painted destroyers, while their ears were deafened by the incessant firing of the guns.

After passing the night on board the *Hohenzollern* the royal party left Kiel on the 6th of September for Berlin and Vienna, respectively. On the same day, the second part of the naval maneuvers was begun by a strategic operation extending as far as Skager Rack and Cattegat. The High Sea Fleet engaged a hostile force superior in number of units, which had as a neucleus the reserve squadron.

After the naval review the following were appointed vice-admirals: Rear-Admirals Bachmann and Von Krosigk; and rear-admirals, Captains Trummler and Stahmer.

The German Emperor has conferred the "Aigle Noir" upon the Austrian admiral, Count de Montecucoli; in return, the German admirals have been decorated with high Austrian orders.

After the naval review, the representatives of the German press were invited by the Navy Department to visit the *Oldenburg*, the latest type of German battleship. The foreign journalists were not admitted on board.

The armored cruiser *Moltke* has left the Blohm & Voss ship yards of Hamburg for Kiel where it began its trial trip flying the battleflag. The *Moltke* is the fourth *Dreadnought* put in service in the space of three months. The *Moltke* and the three battleships of the *Ostfriesland* class have a combined displacement of about 100,000 tons. The *Moltke* represents a considerable advance over the *Von der Tann*, having a displacement of 23,000 tons as against 19,000. The *Moltke*, like the *Von der Tann* has boilers of the Marinekessel type, with small tubes (the *Von der Tann*

has 18; the *Moltke* 24). The speed recorded officially as 25.5 knots, will probably reach 28 knots, as in the case of the *Von der Tann*. The armament comprises ten 28-mm. guns, twelve 150-mm. guns, and twelve 88-mm. guns. With a length of 186 m., the *Moltke* is the longest German warship, being 20 m. longer than the *Ostfriesland*, and 15 m. longer than the *Von der Tann*.

The contract for building the armored cruiser *K* has already been let to the Blohm & Voss shipyards of Hamburg, which have already built the *Von der Tann* and the *Moltke*, and are at present at work on the *Goeben* and the *H*. All the German *Dreadnought* cruisers have been entrusted to this firm which has established a world-wide record (28 knots, 12) for large ships.

The German press is vigorously attacking M. Delcassé, Minister of the French Navy, for having expressed at Toulon, at a time when the Moroccan conference is going on, his extreme satisfaction that the French equipment for war was ready to meet any emergency. "M. Delcassé has not always had," says the *Frankfort Gazette*, "that tact which makes the perfect statesman. It is quite natural that the Minister of Marine should praise his fleet. President Fallières had done this at Toulon some days before; this statesman, however, had been satisfied to speak of the future, while M. Delcassé clearly alluded to the present situation. If we may believe the articles published by M. Ludovic Naudeau in the *Journal*, the results of the first part of the French naval maneuvers were not so brilliant as to justify the superfluous praise of M. Delcassé."—*La Vie Maritime.*

The building program provides this year for the construction of three battleships, one large cruiser, two small cruisers, and twelve destroyers.

The battleship *S*, the large cruisers *K*, the small cruiser *Ersatz-Geier* comprising numbers 7 to 12 of the *G* class, will have Parsons turbines of 281,000 horse-power, representing 58 per cent of the marine engines built this year in Germany. Practically all of the 42 remaining per cent will be turbines allowing the rotary drum which is a feature of the Parsons turbine. Only six destroyers will have the multiple-disk rotors, and it is probable that the number of these disks will be reduced to three.

The change of opinion in Germany as to the efficiency of multiple-disk turbines may be attributed to the numerous accidents that have happened to purely actionary turbines.

The battleship *Thüringen* attained in its trial trip 21 knots, with normal displacement. The *Helgoland* completed successfully in August its preliminary trial trip. It was equipped on the twenty-third of August for its final trial trip. The small cruiser *Cöln* made 26.3 knots, in its trial trip. The battleship *Ersatz-Kurfürst Friedrich Wilhelm* will be built at Hamburg.

The cruiser *Moltke*, which has just completed its trial trip, attained a speed of 29½ knots, thanks to its Parsons turbines. It is a sister ship of the *Von der Tann*. It was launched last year after twenty-nine months had been spent in its construction.

The following is the program for the fleet (construction and armament of new ships) for the half year beginning October, 1911, and ending April, 1912:

1. Ships to be completed by the first of next April: the battleship *Oldenburg*, the cruiser *Goeben*, and the small cruiser *Breslau*. These ships will have made their trial trip by that date.

2. Completion of the cruisers *Kaiser* and *Friedrich der Grosse* and the second-class cruisers *Magdeburg* and *Strassburg*.

3. Continuation of the work on the battleships *Ersatz-Ægir*, *Ersatz-Odin* and *Ersatz-Hagen*, and the Cruiser *J*.

4. Laying the keels of the cruiser *S* and the battleships that are to replace the *Kurfürst-Wilhelm* and the *Weissenburg*; of the cruiser *K*, two small cruisers and an indefinite number of torpedo boats and submarines.

According to the *Ueberall* the contract for the construction of the two battleships *Ersatz-Kurfürst Friedrich Wilhelm* and *Ersatz-Weissenburg*, included in the program for this year, will not be issued for some weeks. The contract is to be let to a private firm since the arsenal at Wilhelmshaven has already a battleship on the stocks, and the one at Kiel is finishing the *Kaiser* after launching. The third battleship included in the program for 1911 has already been ordered. The armored cruiser *K* will be built by a private firm. It has not been decided where the small cruiser *Ersatz-Geier* will be built.

Contracts for the construction of the *Ersatz-Kurfürst Friedrich Wilhelm*, the *Ersatz-Weissenburg* and the fast cruiser *K* will be let out to private firms before a few weeks.

The small cruiser *Ersatz-Condor*, which was put on the stocks last summer, was launched at the arsenal of Wilhelmshaven on the 24th of August. This ship, which has a displacement of about 5000 tons, has been named *Strassburg*. The destroyer *G 194*, built by the shipyard Germania at Kiel, attained a speed of 36 knots.

The old battleships will be used for coast-defence purposes. To this end, an experiment will be made with two battleships of the *Siegfried* class. They are to receive each two 28 centimeter, 40 caliber guns; their hulls are to be made unsinkable. If this experiment is successful, it will be applied to the two *Brandenburgs*. The armor-plating of the two *Siegfrieds* will be replaced by the latest model Krupp steel plates. A similar attempt is being made in England to utilize the *Royal Sovereigns*.

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Orion	22,500	Portsmouth.	Under trial.
Monarch	22,500	Armstrong.	Launched Mar. 30, 1911.
Conqueror	22,500	Beardmore.	" May 1, 1911.
Thunderer	22,500	London (Thames Iron Works).	" Feb. 1, 1911.
Ajax	23,500	Scotts (Greenock).	Building.
Audacious	23,500	Cammell, Laird & Co.	"
Centurion	23,500	Devonport.	Launched Nov. 18, 1911.
King George V	23,500	Portsmouth.	" Oct. 9, 1911.
1	27,00?	"	Authorized.
2	......	Devonport.	"
3	......	....	"
4	......	....	"
Armored Cruisers.			
Lion	26,350	Devonport.	Under trial.
Princess Royal	26,350	Vickers.	Launched Apr. 29, 1911.
Australia	18,800	Brown & Co.	" Oct. 25, 1911.
New Zealand	18,800	Fairfield.	" July 1, 1911.
Queen Mary	26,850	Palmer (Jarrow).	Building.
1	.....	....	Authorized.
Cruisers.			
Active	3,400	Pembroke.	Under trial.
Amphion	3,400	"	Building.
Weymouth	5,250	Armstrong.	Under trial.
Yarmouth	5,250	London & Glasgow Co.	" "
Southampton	5,400	Brown & Co.	Building.
Dublin	5,400	Beardmore.	"
Sydney	5,400	London & Glasgow Co.	"
Chatham	5,400	Chatham.	Launched Nov. 9, 1911.
Melbourne	5,400	Cammell, Laird & Co.	Building.

THE *ORION'S* GUNNERY TRIALS.—One of the most crucial tests in the gunnery trials of the new battleship *Orion*, with her 13.5-inch armament, was that of the "blast" test. The ship appears to have emerged from this test with no more damage to her hull and fittings surrounding the muzzles of the large guns, in their arc of fire, than could have been expected, considering she is the first ship of her type to be armed with the 13.5-inch gun of modern pattern. The charges of the old 13.5 weapon were much less powerful and the blast, therefore, much less destructive, than the 12-inch guns that succeeded them; but it was necessary in both cases, in the earlier type of battleship, to fit what is known as a "flash plate" across the sweep of deck over which the muzzle of the guns passed from any point at which they could be fired, in travelling from one broadside to the other. At the *Orion* trials the bottom of a boat was blown out by the blast, but that is not at all exceptional in a new ship firing her guns for the first time; indeed it is by such experience, showing which line the released gases are likely to take, that the ill-effects of the blast can be reduced to a minimum. Taken altogether, the authorities appear to have largely anticipated the safeguards which would be required, and have successfully placed them in position.—*United Service Gazette*.

THE BATTLESHIP ORION.—The center-line system of mounting the guns has been adopted for the *Orion*, owing to the increased weight and power of the new weapons. Any other arrangement would have subjected the ship to great strains, necessitating an increased displacement. By the center-line system, so successfully exploited by the American designers, the maximum arc of fire for each turret is gained, but at the same time the ahead and astern fire is curtailed. In view of the declining importance of axial fire, this cannot be regarded as a drawback.

Two of the five turrets are mounted on the forecastle, the after one being raised to enable its guns, theoretically, to fire over the other. A third is situated amidships on the center-line aft of the superstructure carrying the single tripod mast and pair of funnels. This turret is on the same level as the upper deck, and the superstructure, both forward and aft of it, has been carefully cut away in order to give the widest possible arc of training, which must be at least 120 degrees on either beam. Further aft is a raised superstructure carrying some of the 4-inch guns of the anti-torpedo armament, a pair of boat hoists, and a second conning tower. The two remaining turrets are superimposed, the higher being on a level with the bow turret, and having a very wide arc of training indeed. Although in theory two of the turrets can fire over those below them, it is extremely unlikely whether they will ever do so in practice, even in the case of the lighter 12-inch turrets of the *Neptunes*. During the gun trials of the *Minas Geraes* and the *Neptune*, it is found that living organisms would not suffer to any great extent from the blast of such firing, but it is very doubtful if they would be equally unaffected by the far heavier discharge of the new battle gun. Consequently it is misleading to regard the ahead or astern fire of the *Orion* as more than two guns, and the number does not increase to four until the target is some degrees to one side of the axial line of the ship. If there are no grounds for this assumption, it is difficult in the design of the new cruiser *Lion* to account for the turret which is placed between the second and third funnel not having been superimposed above the stern turret so as to swell the astern fire. Without gaining increased axial fire astern, the system of superimposed turrets does give some advantages. Turrets so mounted do not take up so much of the length of a ship as would the same turrets if mounted on exactly the same level, as in the American vessels of the *Utah* and *Delaware* classes. Again, the training of such turrets is only curtailed by considerations of blast, and they can be safely trained over small additional arcs which would be impossible in the cramped American system owing to the interference of the adjacent turret. Another con-

sideration is the possibility of the jamming or disablement of the stern turret, when, without the superposed guns the stern fire would be greatly curtailed.

There is very little in the disposition of the main armament which can be criticised adversely. It is a great improvement on the two systems of mounting ten guns which has hitherto been adopted in British *Dreadnoughts*, and is superior to that adopted in the four American examples above quoted, in which two of the turrets are rather cramped.

With regard to the total weight of broadside, the following table shows the great superiority of the *Orion* over all foreign ships of the same program (1909-10) in this respect:

Name.	Broadside.	Total weight (lbs.)
Oldenburg (Germany)	8 12.2-in.	7,848
Kaiser (Germany)	10 12.2-in	9,810
Arkansas (U. S. A.)	12 12-in. 50 cal.	10,404
Courbet (France)	10 12-in. 50 cal.	9,720
D. Alighieri (Italy)	12 12-in. 46 cal.	11,032
Cavour (Italy)	13 12-in. 46 cal.	11,951
Moreno (Argentine)	12 12-in. 50 cal.	10,404
Hercules (Great Britain) ..	10 12-in. 50 cal.	8,500
Lion (Great Britain)	8 13.5-in. 45 cal.	10,000
Orion (Great Britain)	10 13.5-in. 45 cal.	12,500

The Italian vessels *Dante Alighieri* and the three *Cavours* are the only serious rivals in this respect, mainly through the number of guns mounted being twelve in one case and no less than thirteen in the three others, in spite of their displacement being no more than 21,500 tons. The British Admiralty ever since the introduction of the *Dreadnought* has steadfastly set its face against armament of more than ten guns, with the result that the *Hercules*, the last of the British 12-inch gun ships, makes a poor showing in the above table in comparison with the *Arkansas*, *Dante Alighieri*, *Cavour*, *Moreno*, and also the older Brazilian *Minas Geraes*. Hence the introduction of the 13.5-inch was very welcome, in view of the official adherence to a ten-gun armament. However, foreign nations have not been slow to follow the British lead, and in the program of 1910-11 and 1911-12 provision has been made by the United States for four ships mounting a new 14-inch, and by Japan for four ships with 13.5-inch guns. Germany intends to mount 14-inch in some of her new ships, and France has a 13.4-inch weapon on the tapis. As the broadside of the new American ships amounts to about 14,000 pounds, it will be necessary to make further improvements in the main armament of the *Orion's* successors.

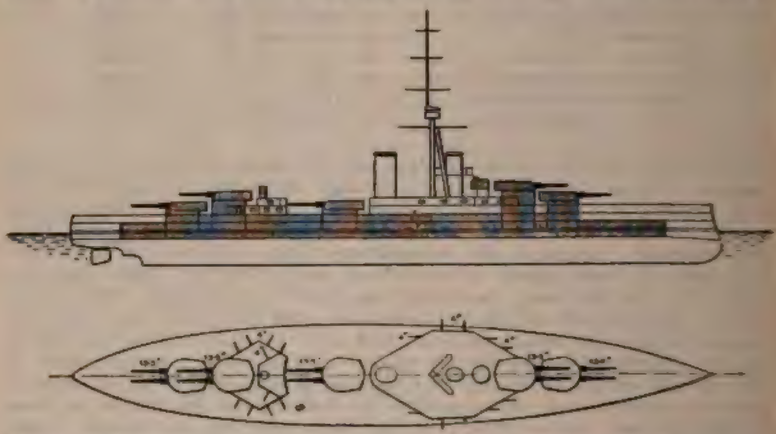
Unlike previous British *Dreadnoughts*, the armor protection is continued right up to the upper deck, and this upper strake extends from the forward turret to a point just aft of the fourth turret. The main belt is believed to be 12 inches thick, tapering to four inches at the ends, and is not quite complete, as it is considered sufficient to protect the extremities of the ship by minute subdivision into compartments. Owing to the fine lines of modern battleships and armored cruisers, the armored protection could at best be only a few inches thick, and would be quite useless for keeping out shells.

The machinery of the *Orion* was contsructed by the Wallsend Company, and consists of Parsons turbines of 27,000 horse-power, driving four screws, and giving the usual battleship speed of 21 knots. Eighteen Yarrow boilers arranged in three groups supply steam, and can be fired by oil fuel as well as coal. The total fuel supply is 3700 tons, including 1000 tons of oil, sufficient for a large radius of action.

In spite of the increased weight of the heavy armament and the great increase in length of the *Orion*, the jump in displacement has not been remarkable. The *Neptune*, with her ten 12-inch, has a displacement of

19,900 tons, and a length between perpendiculars of 510 feet; the *Orion* is heavier by 2780 tons, while her length is 545 feet between perpendiculars. Over all she measures no less than 584 feet, has a beam of 87 feet, and normally draws about 27½ feet.

In speed of construction the battleship *Orion*, although the first ship of a new type, bids fair to rival the *Vanguard*, which was commissioned within 23 months from the laying of her keel-plate. The *Orion* was laid down at Portsmouth on November 29, 1909, and having begun her trials on the 11th inst. will return to that port if all goes well on the 25th, which will leave more than five weeks to enable her to be commissioned within the period taken by the *Vanguard*. It is satisfactory to note what the position with regard to the construction of the new type will be in March, 1913, when the first foreign vessel mounting 14-inch weapons comes into commission. This ship is believed to be the *Ersatz Odin*, building at Kiel, although there is no definite information on the subject. When she joins the pennant Great Britain will possess a division of eight battleships



OUTBOARD PROFILE AND DECK PLAN OF "ORION," SHOWING DISPOSITION OF GUNS AND ARMOR.

and in addition three armored cruisers all armed with 13.5-inch guns. By March, 1914, ten other ships will have been commissioned for Germany, Japan and the United States, while five more will join the British Navy, and so to this extent will Great Britain lead the world at that date.—*Military Record.*

The battleship *Orion* returned to Portsmouth Harbor on the 26th ult. on the completion of her gun trials, which, with all the other tests imposed upon her, are officially described as having resulted very satisfactorily. Four full charges were fired from each gun on extreme bearings. The whole ten 13.5-inch guns were also trained on a broadside and fired simultaneously. This caused the ship to heel over about three degrees, but did not damage the hull. When the two guns in the elevated barbette were fired four boats on the upper deck were broken up by concussion. The mountings of all guns, however, showed no signs of weakness. The *Orion* also successfully carried out her torpedo trials and will now prepare for the pennant. The result of the trials is of additional interest owing to the circumstance that she carries ten 13.5 guns and in view of the position of the guns in the ship and their mounting. The ship's structure withstood well the heavy strain thrown on it by discharge of the guns. The hull was examined at intervals during the progress of the

firing, but showed no sign of having suffered injury from concussion. As usual some breakage was caused amongst glass and lighter woodwork, but this is of no account.

H. M. BATTLESHIP KING GEORGE: AN IMPROVED ORION.—Nothing official concerning the battleship *King George V.* has been, or will be obtainable, but from what is known, says the *Times*, the following particulars will be found substantially correct.

It is understood that in all essential details, such as the gun power and the number and position of the guns in the ship, the arrangements in the *King George V.* will be similar to those in the Orion. The new vessel will, however, be 15 feet longer, with 6 inches more beam, and will displace about 1500 more tons than her predecessors, as it is believed that the length of the *King George V.* is 555 feet between the perpendiculars, 596 feet over all, with a beam of 89 feet, and that her displacement when completed will be about 24,000 tons, her launching weight being approximately 9000 tons. The machinery is to be of the Parsons steam turbine type, working four shafts and four propellers, capable of developing a shaft power of 31,000 horse power, giving a speed of 21 knots. The steam is to be furnished from 18 water-tube boilers. The main armament will consist of ten 13.5-inch guns disposed in five turrets being placed in the center-line of the ship, and giving a broadside fire of 10 guns, and ahead and astern a fire of four, the second and fourth turrets being raised to enable the guns to fire over the first and fifth. The secondary armament for repelling torpedo attacks will be the latest type of 4-inch guns, which will be mounted under armor, the increased weight of the vessel enabling better protection to be given.

The *King George V.* will have one mast, and three submerged torpedo tubes for firing the 21-inch torpedo. The officers will be berthed in the after part of the ship and the men in the forward part, as it has now been found that this arrangement answers best. In consequence of this reversion the vessel is fitted with an Admiral's stern walk, which no battleships built in recent years have carried.—*Naval and Military Record.*

BRITAIN'S TWENTY-FIRST DREADNOUGHT.—The battleship *King George V.* was the first vessel of the 1910-11 program to take the water. She is the twenty-first British *Dreadnought*, and the seventh ship designed to carry the 13.5-inch gun. In all essential particulars she is similar in design to the *Orion*, whose trials have just been successfully completed, but is about twenty feet longer and over one thousand tons heavier in displacement. Like the *Orion*, the *King George* will carry ten 13.5-inch guns and about 20 4-inch as the anti-torpedo armament. The heavy guns will be in five double turrets mounted on the center line of the ship, the aftermost fore turret and the foremost after turret being raised above the others. The *King George V.* is the second ship in the navy to bear the name of a reigning sovereign. She belongs to the first program of King George's reign, as the *King Edward VII.* belonged to the first program of King Edward's reign, and a comparison of the two gives a fair idea of the evolution of the "capital ship" since 1902, when the *King Edward* was laid down at Devonport Dockyard.

	King Edward VII.	King George V.
Displacement	16,350 tons	24,000 tons
Length	454 ft.	506 ft.
Beam	78 ft.	89 ft.
Complement	777	900
Speed	$18\frac{1}{2}$ knots.	21 knots
Guns	4 12-in.; 4 9.2-in.; 10 6-in.	10 13.5-in.
Weight of broadside	4,080 lbs.	12,500 lbs.
Armor	9-in. belt.	12-in. belt
Torpedoes	18-in.	21 in.

—*Naval and Military Record.*

OUR NEXT BATTLESHIPS.—The Admiralty, says *Engineering*, has invited private firms to submit tenders by the end of the month in connection with the construction of four battleships. Two of these battleships with their machinery, will be built in private works, and prices are asked for hull and machinery, while two will be constructed respectively at the Portsmouth and Devonport dockyards, and engineering firms are asked to submit prices for the construction of the Parsons turbine machinery and the Babcock or Yarrow watertube boilers for these. One more armored ship is included in the navy program for the current year, and this will be a cruiser of the *Lion* type, to be built by contract, and to complete a cruiser fleet unit of four such vessels of 28-knot speed with practically the fighting power of battleships. The other three vessels are, of course, the *Lion*, the *Princess Royal*, and the *Queen Mary*. The new battleships will resemble the four ships of the *King George V* class, which are to be launched within the next three or four months. The differences in the new battleships are unimportant, though it is probable that an advance will be made in connection with the torpedo-repelling guns. There will be a slight increase in displacement to over 24,000 tons, and the horse-power will be increased to 29,000 in order that the same speed of 21 knots may be easily realized.

A Glasgow correspondent says: Private builders are also tendering for seven special destroyers of exceptionally high speed. The tenders for three protected cruisers were sent in to the Admiralty on Wednesday.

The four battleships (says the London correspondent of *The Glasgow Herald*, are as a matter of course to be bigger than their immediate predecessors—how much bigger it would not be fair either to the Admiralty or their contractors at this early stage to say. Like every other type of warship, battleships have a sort of natural tendency to grow, although the effect on offensive or defensive quality is not always visible to, so to say, the naked eye. The *Bellerophons* displace 700 tons more than the *Dreadnought*, but they carry sixteen 4-inch guns instead of her twenty-seven 12-pounders. The *St. Vincents* displace 650 tons more than the *Bellerophons*, yet have only to the eye of the observer four 4-inch guns more. The *Neptunes* displace 750 tons more than the *St. Vincents*, and on the bigger dimensions are able to give a broadside of ten 12-inch guns without any apparent sacrifice in ahead or astern fire. The jump from the *Neptunes* to the *Orions* is 2250 tons, and for that we get at any rate the middle line arrangement and increase of an inch and a half in the caliber of the main guns. As I indicated on Tuesday, we get in the *King Georges* a better and better protected anti-torpedo armament for the additional 2500 tons. Of course there have been other improvements costing weight, but only striking features like those which I have indicated as a rule interest the public. For the greater displacement of the projected ships I assume we shall get 4.7-inch guns, and as a matter of course better 13.5-inch guns. The displacement is in the region of 27,000 tons.—*Naval and Military Record*.

Laid down on February 19 of last year, at the works of Vickers & Co., Barrow, the new protected cruiser *Dartmouth* of the improved town class, built and equipped at an estimated cost of £334,847, yesterday carried out her eight hours' acceptance trial preparatory to her delivery to the Admiralty. The *Dartmouth* is the second cruiser of her type to be completed for sea, the first, the *Falmouth*, having recently joined the Second Battle Squadron as an attached ship. The *Dartmouth* has a length of 430 feet, a breadth of 48 feet 6 inches, and a displacement of 5250 tons, while her turbines are of 22,000 horse-power, and capable of propelling her at a speed of 24.75 knots. Her armament consists of eight 6-inch breech loading guns.—*United Service Gazette*.

The construction of the second-class protected cruiser *Chatham*, building at Chatham Dockyard, is so far advanced that the contractors for the

engines, the Thames Iron Works Company, have commenced to make the preparation on board for putting in certain parts of the machinery before the vessel leaves the slipway. The ceremony of launching the *Chatham* is expected to take place early in November. There has been no public launch at Chatham since the battleship *Africa* was set afloat, more than six years ago.—*United Service Gazette.*

Owing to a variety of causes the armored cruiser *Lion*, the first of the class to be fitted with 13.5-inch guns, is not up to program time. The *Lion* was laid down at Devonport Dockyard on November 29, 1909, and it was expected that she would have been ready by the end of September or the early part of October to commence her steam trials, which are being looked forward to with unusual interest owing to the machinery being designed for 70,000 shaft horse-power. The contracting engineers have been hampered by labor trouble, and it has now been found desirable to disconnect the whole of the shafting to re-test its accuracy owing to one portion being slightly out of alignment. The dockyard portion of the work is also in arrear owing, it is stated, to the *Lion* embodying several new features. Instead of the cruiser being ready for service in two years from the laying down of the keel, there is now no prospect that she will take her place in the fleet before the latter part of January at the earliest. —*United Service Gazette.*

The new protected cruiser *Falmouth*, laid down on February 21, 1910, at the works of Messrs. W. Beardmore & Co., of Dalmuir, has been reported ready for delivery from the builders as completed for commissioning. The *Falmouth* is the first of the improved *Bristol* class of cruisers, and has been constructed with a length of 430 feet, and a displacement of 5250 tons, being 450 tons larger in displacement than the cruisers of the *Bristol* class. Her armament is also of a more powerful type, consisting of eight 6-inch breech-loading guns, compared with two 6-inch and ten 4-inch guns mounted in the earlier cruisers. Her estimated cost is £339,274.

STEAM TRIALS OF H. M. S. SANDFLY.—The torpedo-boat destroyer *Sandfly*, built for the British Navy by Messrs. Swan, Hunter and Wigham Richardson, Limited, Newcastle-on-Tyne, and fitted with her machinery by the Wallsend Slipway and Engineering Company, Limited, Wallsend-on-Tyne, completed on Monday, the 23d of October, her official eight hours' steam trials, when she attained a speed of 27.7 knots with the turbines running at a mean of 741 revolutions and developing 15,700 shaft horse-power. The designed speed was 27 knots. On her 24 hours' fuel consumption trial on the preceding Wednesday the oil used was about 1 pound per shaft horse-power per hour. The *Sandfly* is 240 ft. long, 25 feet 9 inches beam, and at 7 feet 10 inches draft displaces 780 tons. She is armed with two 4-inch quick-firing and two 12-pounder guns.

The fleet coaled again on Monday. The coaling was only a small one, but was very well executed. The *Duncan* and *Triumph*, as usual, tried to out-vie each other with their well known coaling feats. On this occasion they were fairly close, the *Duncan* leading. The *Swiftsure* was a very good third. These short coalings are very strenuous, and it is amusing to see the craft and subtlety adopted to prevent any loss of "time." Results:

	Amount.	Average per hour.
1. Duncan	670	423.2
2. Triumph	530	413
3. Swiftsure	580	386.8
4. Bacchante	535	321
5. Exmouth	500	309.3
6. Russell	665	249.3

—*Naval and Military Record.*

H. M. S. *Archer*, the first of five destroyers of special type under construction for the British Admiralty at the works of Messrs. Yarrow & Company, of Glasgow, was launched on Saturday the 21st inst. The vessel is 240 feet long by 25 feet 7 inches beam, propelled by twin screws driven by turbines of the Brown-Curtis type constructed by Messrs. Yarrow. Steam is supplied by three Yarrow water-tube boilers fired by oil fuel and fitted with a special form of superheater designed by the firm.

BRITISH BATTLESHIP BUILDING PROGRAM.—The only lesson which the unfortunate outbreak of war between Italy and Turkey has, so far, taught, or appears likely to teach, is the need of complete preparedness for war at all times, since once more it has been demonstrated that the "bolt from the blue" is not the mere imagery of the poet. As with Japan, so with Italy, the issue of the ultimatum, or declaration of war, was instantly followed by military operations. Although such action may not of itself ensure in all cases ultimate success, it confers a considerable advantage in the initial stage, which may influence greatly the final issue. It is therefore gratifying to note the unequivocal pronouncement of the First Lord of the Admiralty in reference to our building program, which is an important item in any scheme of preparedness for war. Like every other citizen, he is anxious for the minimising of naval expenditure as far as prudence permits, but he has once more laid down the dictum that our program must be determined with full conception of the effect in war strength, at any future date, of the building operations of possible combatants. Thus he naturally awaits the issue of the estimates of foreign powers before completing the preparation of his financial and shipbuilding proposals for next year.

In the meantime it is agreeable to record simultaneously the satisfactory completion of the searching trials of the first of our ships fitted with the 13.5-inch gun, the prospective launch within the next three months of of our new battleships, the issue of orders to Portsmouth and Devonport dockyards each to prepare for the building of a battleship, and the sending of invitations to private firms to tender for the building of two battleships included in the current year's program. In addition to these four battleships closely resembling the four ships of the *King George V.* class, soon to be launched, there will be a fifth armored ship. This will be a cruiser of the *Lion* type, and will also be built by contract. This vessel will complete a cruiser fleet unit of four ships of 28 knots speed, with practically the fighting power of battleships. The differences in the new battleships, as compared with *King George V.* class, are unimportant, although it is probable that an advance will be made in connection with the torpedo-repelling guns. There will be a slight increase in displacement to over 24,000 tons, and the horse-power will be increased to 20,000 shaft horse-power in order that the same speed of 21 knots may be easily realized. More it might not be patriotic to divulge at the present moment, and we depart from the remark that the Admiralty obviously intend to place the orders for the three contract armored ships, and for the machinery for the two ships to be built in the dockyards, before the end of the year, since the tenders for battleship work are to be at the Admiralty by the 31st of the present month.

The *King George V.* is to be launched on Monday from the Portsmouth Dockyard, the *Centurion* from the Devonport Dockyard a month later, and in December the Scotts' Shipbuilding and Engineering Company will launch the *Ajax*, and Messrs. Cammell, Laird & Co. the *Audacious*. All four ships are in a satisfactorily advanced stage, so that notwithstanding the labor troubles, they are likely to be completed in two years from the date of laying the keel; but it is probable that they will not be ready for commission before the beginning of 1913. These ships are a development of the *Orion* class. It seems almost inevitable that the demands of the strategist and tactician should, in the case of each successive ship, involve increased displacement.

The machinery, as in all of the later battleships, is of the Parsons type, and the constructors were the Wallsend Slipway and Engineering Company. The two low-pressure turbines are in one center engine-room, and the low-pressure astern turbines are incorporated in the same casing as the ahead turbines. Each wing-shaft has a separate high-pressure ahead and astern turbine, the ahead turbines being arranged with cruising blading, to be cut out when the vessel is running at high speed; a by-pass valve is fitted for this purpose. The boilers are of the Babcock and Wilcox type, fitted to burn coal and oil, and, as in the usual Admiralty practice, quite 2 square feet of heating surface is allowed for each horse-power to be developed, the ratio of heating to grate surface being 35 to 1. The condensers are of Weir's "Uniflux" type, with Weir's dual-type pumps. On the trials, which were attended by Mr. Andrew Laing, the managing director of the contracting company, and by Engineer-Captain Onyon, on behalf of the Engineer-in-Chief, the results were in excess of those anticipated in the designs. Trials were run at progressive speeds, in order to determine the radius of action at given speeds. The principal trial was that of 30 hours duration at two-thirds power (18,500). On this trial the mean revolutions of the turbines were 298, and the horse-power developed 18,960, the fuel consumption being 1.8 pound per shaft horse-power per hour. During this trial six runs were made over the measured distance at Polperro, when the speed was found to be 19.5 knots with the engines developing 18,900 shaft horse-power. On the eight hours' full power trial the mean revolutions were 346, and the shaft horse-power 27,600, the four runs giving a mean speed of 21.02 knots, with the engines developing 27,400 shaft horse-power. At full power the fuel consumption was equal to 1.62 pounds of coal per shaft horse-power per hour. In a subsequent trial, with the engines more fully opened up, 29,700 shaft horse-power was maintained. It will thus be seen that the 21 knots anticipated in the design were realized, and that, in emergency, even a greater speed can be got out of the machinery.—*Engineering.*

An admiralty order received at Pembroke Dockyard directs the authorities to commence building a new unarmored cruiser, for which initial provision was made in the Navy Estimates for the current financial year. The new ship will be a replica of the *Active* and the *Amphion*, now being constructed at Pembroke Dockyard. Her length will be 385 feet, and her displacement 3360 tons. She will be equipped with Parsons-Curtis turbines of 18,000 horse-power, and will steam 25 knots per hour. A sum of £11,200 will be spent in labor on her during the year.—*United Service Gazette.*

NEW DESTROYERS ORDERED.—Messrs. J. Samuel White & Co., of Cowes and East Cowes, have received an order for six ocean-going destroyers of a special type, larger than those generally adopted. At Sheerness on Monday the *Ferret*, ocean-going destroyer, built at Cowes for the British Navy by Messrs. White & Co., developed a speed of 30 knots on an eight hours' speed trial, or three knots in excess of her contract speed.—*Pages Weekly.*

NAVAL CONSTRUCTION.—There is a general agreement that the authorities have made a wise decision in selecting Sir William Smith as the successor to Sir Philip Watts. The new director of Naval Construction has not only a high reputation as a designer of ships, but he has done plenty of sound, solid work as an instructor of other naval architects at the Royal Naval College. His practical experience as a draftsman and constructor goes back a matter of forty years, and covers the period of the later ironclad vessels as well as those of the area of steel. More recently he has filled the post of superintendent of construction accounts and contract work, in which he has been brought closely in touch with the officials of the great private shipbuilding establishments. Here he won golden

opinions by his tact and good temper, just as his ability and industry had gained for him the commendation of his colleagues. Thus his appointment gives satisfaction in all quarters, and not the least to the Royal Corps of Naval Constructors, who are gratified that one of themselves should have been chosen instead of the post going outside the Admiralty, as at first appeared to be possible. No date appears to have been fixed for the departure of Sir Philip Watts, but when it comes there will be much regret at his leaving. His name will always be associated with the *Dreadnought* era, and with the many notable vessels to which it has given birth. It is quite possible, however, that during the next few years we may see another change, and that his successor may have the honor of designing the first gas-driven battleship for the British Navy.—*Army and Navy Gazette.*

THE COMING NAVAL OFFICERS.—To show how thorough the Admiralty intend the test of the general knowledge on all subjects to be, in the examination of the sub-lieutenants of the new system of training who are now passing for lieutenants, it is only necessary to select one of the subjects in which this knowledge will be tested. If we choose that of gunnery, as one only of the principal subjects, we find that the questions which have to be answered are very searching, for a candidate will be tested practically in almost every phase of up-to-date naval gunnery, and the ramifications of this science are rather more than considerable. He will be tested in adjusting, stripping and assembling hand-worked gun mountings, and he will have to describe the method of stripping and examining all the principal machinery of a 12-inch gun turret, and know all the probable causes of breakdowns and their remedies. He must have a thorough knowledge of all the leads and contacts of gun circuits, and know their tests and how to repair them, and also all the safety arrangements. A good knowledge of the sighting of all kinds of guns is required so as to be able to instruct a gun's crew or himself do the duties of a number at hand-loading and power worked guns, and he must be acquainted with the machinery and fittings of turrets. He must also know all about the projectiles, charges and fuses used with naval ordnance, and the methods of getting them on board and storing them in the magazines. He must have a knowledge of field training, and a thorough knowledge of hydraulics and how to organize a ship for war and battle; of fire control and night defence; of calibration and all sighting and controlling instruments, etc. It will thus be seen that if his training has been expensive it has also been extensive, and that he will be one of the best trained naval officers in the world if he reaches the standard expected of him.—*United Service Gazette.*

Throughout the navy it will be noticed with interest and appreciation that in approaching the consideration of the subject of a War Staff for the Navy Mr. Churchill called to his counsel the most experienced officers of the fleet. At his right hand he had Sir Authur Wilson, then within a few days of Mr. Churchill taking office, Lord Fisher had returned from Switzerland and conferred with the First Lord. A day or so later Lord Charles Beresford was very appropriately also called into counsel. Lord Charles has in recent years consistently urged the necessity of creating a staff for the navy, and it was apparent when the report of the Cabinet Committee was issued that Mr. Asquith and his colleagues had come to the conclusion that the Admiralty organization left something still to be desired in this direction. The members of the Cabinet seemed to believe that a Naval Staff would dissipate all differences of opinion between officers of high rank and professional attainment on questions of strategy, tactics and fleet organization. This is an erroneous conception of its duties. The last thing that is desirable is that any machinery shall be created which will interfere with the free exercise of thought and the healthy differences of opinion which make for progressive action. The

navy has certainly no desire to see any machinery invented which will compress its thought within narrow channels.

The end in view in establishing a Naval Staff is the better to fit the navy for quick and decisive use directly a state of war exists. Prior to the beginning of the present century such a staff would have found itself floundering in a hopeless morass. The active fleet at that time was still distributed on the principles laid down one hundred years before. The presence of half-manned and undrilled coast and port guardships testified to the survival of the coastal defence ideas which held sway at the beginning of the Victorian period, and practically there was no reserve organization of the fleet; the Board of Admiralty was under-manned and the Intelligence Department was largely dominated by the civilian element. Under Lord Walter Kerr, and more particularly as a result of the energetic reforms instituted by Lord Fisher, all this has been changed. The fleet is now distributed in accordance with the strategic needs of the moment. The bulk of the personnel is utilized in effective men-of-war: the Board of Admiralty has been immeasurably strengthened by the appointment of officers to assist the Sea Lords, and the Naval Intelligence Department has not only been strengthened, but has been relieved of the work of naval mobilization and the preparation of war plans, which it was supposed to carry out under the old régime. At the same time the Naval War College has been developed. The foundations have, in fact, thus been laid for the creation of a staff which shall be an extension of the mind of the First Sea Lord, a link with the growing navies of the oversea dominions, and a school of thought for the fleets at sea.—*Naval and Military Record.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.	
Battleships.				
Dante Alighieri	19,000	Gov't Yard, Castellamare.	Launched	Aug. 20, 1910.
Cavour.	22,000	" " Spezia.	"	Aug. 10, 1911.
Giulio Cesare	22,000	Ansaldo-Armstrong.	"	Oct. 15, 1911.
Leonardo da Vinci ...	22,000	Genoa (Odero).	"	Oct. 14, 1911.
Scouts.				
Quarto.................	3,400	Venice.	"	Aug. 19, 1911.
Marsala	3,400	Castellamare.	Building.	
Nino Bixio............	3,400	"	"	

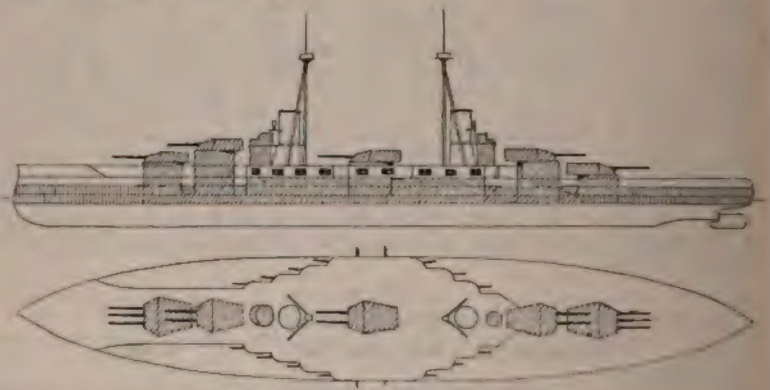
ITALIAN DREADNOUGHT "CONTE DI CAVOUR."—The *Conte di Cavour*, Italy's second *Dreadnought*, was launched at Spezia last August. In design she is quite the most unique of the many and varied types of battleship which come under this heading, and possesses the proud distinction of mounting the most numerous all-big-gun battery yet put into a modern warship, which consists of thirteen 12-inch guns.

As may be seen from the plan, these are carried in five turrets, of which two are raised to fire over the fore and aftermost and the remaining one is amidships between the masts. These three lower gun-houses carry three guns apiece, while the raised positions contain the ordinary twin-mounting. All can be trained on either beam, and five axially ahead or astern, giving her a fire concentration of 11,050 pounds per broadside and 4250 pounds in the latter directions. For comparative purposes we append a table showing the fire concentration and main details of her contemporaries.

The anti-torpedo battery is carried along the upper deck and consists of eighteen 4.7-inch guns, while a tertiary armament of fourteen 14-pounders is distributed over the superstructures and turret tops. These are not shown in the plan, as their exact positions are uncertain. A somewhat novel and original way of spacing the 4.7-inch guns has been adopted

in order to provide for a heavy end-on fire. The hull side is deeply recessed in a series of steps fore and aft of the two center 4.7-inch ports so as to provide accomodation for four guns forward and three aft per broadside.*

Turning again to the main armament, the actual battle-value of this huge collection of ordnance is a somewhat debatable point. As we have mentioned in preceding articles, the maximum number of guns that can be "controlled" from central range-finding stations is ten. What system is in use in the Italian navy is uncertain, but unless they have some such arrangement of the range-finders as is in vogue in Germany, *i. e.*, one to each turret, whereby the groups of guns would be under five individual controls, it is unlikely that the fullest use will be obtained with the best results from the thirteen guns.



PLAN OF THE "CONTE DI CAVOUR."

	Nation.	Dis-place-ment in tons.	Speed.	Armament.	Broadside. (Not including tertiary or 4" guns).	Axial.
					lbs.	lbs.
Orion	Great Britain	22,600	21	10 13.5" guns 16 4" "	12.500	5,000
Arkansas	U. S. A	26,000	20.5	12 12" " 21 5" "	10,800	3 640-3,700 astern
Jean Bart	France	23,000	20	12 12" " 22 5.5" "	10,426	8,156 8,320 astern
Veritus Unitis	Austria	20,000	21	12 12" " 12 6" " 18 smaller	12,749	8,157
Sao Paulo	Brazil	19,250	21	12 12" guns 22 4.7" "	10,695	7,090
Helgoland	Germany	22,800	20.5	2 12" " 14 5.9" " 14 3.4" "	8,478	4,240
Sevastopol	Russia	23,000	23	12 12" " 6 4.7" "	9,056	2,336
Moreno	Argentine	27,940	22.5	12 12" " 12 6" " 12 4" "	10,890	7,010 4,602
Conte di Cavour	Italy	21,800	22.5	13 12" " 18 4.7" "	11,402	4,558 astern

* Current plans incorrectly give her no forecastle deck, and these 4.7-inch carried in groups of four, one and four instead of four, two and three

The three-gun turrets are now no longer a novelty, although it so happens that the *Cavour* is the first ship so fitted to be discussed in these columns. In any case they can only be regarded as a weight-saving but risky device employed *faute de mieux* in order to crowd in an increased number of smaller guns instead of substituting fewer guns of larger caliber. The *Cavour* could, and would, doubtless have been armed with ten 13.5-inch had these pieces been available in Italy, and for this reason her being fitted with thirteen 12-inch can only be looked upon as a temporary expedient to produce a more powerful ship than her neighbors, pending the introduction of the 13.5-inch, 14-inch or even 16-inch gun.

The armor protection is somewhat light for a ship of her size, but taken in conjunction with the armament and designed speed of 22.5 knots with 24,000 I. H. P., it is probably a good deal more extensive than could have been allotted to a similar ship built elsewhere. In our article on the *Napoli* (August, 1909), we mentioned in passing the Italian ability to get a better all-around ship on a given displacement than could be produced elsewhere. Where robustness is not the essential that it is to some nations, weight in scantlings, supports and frames can be reduced to what in our own ships would be probably below the minimum, added to which the wholesale use of asbestos fittings and hollow metal-work wherever possible, and you have a drastic saving in weight which can be utilized in other directions.

On paper the *Cavour* is, with the exception of our *Orions*, the most powerful ship afloat, added to which she has a higher designed speed than any battleship built or building, except the Russian *Poltava* class, and could therefore choose her own range in action, and maintain the best maneuvering positions. In practice her lack of displacement must tell somewhere or sometime; either in her ability to stand continuous firing, big-gun hammering, torpedo attack by below-water protection, or seaworthiness and speed-keeping in heavy weather. As she stands, however, the *Cavour* is a monument to Italian ingenuity in weight saving.

The thickness of the belt (water-line) is uncertain, but will doubtless be similar to that of the *Dante Alighieri* which preceded her, *i. e.*, 10 inches amidships with continuations 6 inches forward and 4 inches aft. The protective deck is 1¾-inch only. An 8¾-inch strake covers the lower deck side and forms a redoubt, while the battery is behind 5-inch armor. The big gun barbettes and turrets have 9¼-inch protection, and there are two 11-inch conning towers of a novel pattern. Details of these are lacking, but from the model of the ship they appear to be three-story structures and will probably contain the central gun-control stations. The tripod-masts will be a good deal lighter than those fitted to our ships and carry a small observation platform, wireless rig, etc.

It is also reported that the funnel-bases are to be armored, but no confirmation of this can be obtained. In view of their close proximity to the 4.7-inch battery guns, it is most likely that this necessary precaution will be taken against having the flats permeated with smoke and fumes from pierced uptakes.

The *Cavour* class will have their steam generated in Blechynden or Babcock boilers, and be turbine driven. Their coal supply is not likely to differ much from that of the *Dante Alighieri*, which is normal 1000 and maximum 2500 tons.

British pattern "Bullivant" torpedo-nets will be stowed along the battery deck.

Two sisters, the *Giulio Cesare* and *Leonardo da Vinci*, are building at the Odero and Orlando yards respectively, and all three ships are to be completed by 1913.—*The Marine Engineer and Naval Architect.*

The first of the Italian scouts, the *Quarto*, was launched on Saturday August 19, in the somewhat cramped space of Venice Arsenal. She was

laid down on November 11, 1909, and will be ready for sea in five months. Her designer, Ing. Truccone, has paid special attention to her internal strengthening, and has given her a double bottom for two thirds her length. She has ten Blechynden boilers and four Parsons' turbines developing 25,000 horse-power, and carries 450 tons of liquid fuel—her only fuel—and 200 blockade mines. Some of her principal dimensions are as follows: Length between perpendiculars, 130.50 m.; breadth, maximum, 12.80 m.; draft, 3.95 m.; speed, 28½ knots; armament: six guns—two bowchasers and four stern—of 120 mm.; six guns, 76 mm.; two torpedo tubes, 450 mm. —*Engineering.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Aki	19,800	Kure.	Under trial.
Kawachi	20,800	Yokosuka.	Launched Oct. 15, 1910.
Settsu	20,800	Kure.	" March 30, 1911.
——	24,000	"	Ordered.
Armored Cruisers.			
Kongo	27,000	Vickers.	Building.
Haruna	27,000	Kobe.	"
Kirishima	27,000	Nagasaki.	"
Hiyei	27,000	Yokosuka.	Ordered.
Protected Cruisers.			
Shikuma	5,000	Sasebo.	Launched Apr. 1, 1911.
Yahagi	5,000	Nagasaki.	" Oct. 3, 1911.
Hirado	5,000	Kobe.	" June 29, 1911.

JAPAN AND HER NAVY.—Big naval shipbuilding programs still hold their own in the international "fashion" lists, and the latest country to bestir itself in this direction is Japan. It is well-known that, although the "Flowery Kingdom" had soaring naval ambitions when she so triumphantly finished off her war with Russia, yet, since she did not receive a single kopeck of indemnity from the great Colossus of the North whose bubble she so effectually pricked, Japan was left in very straitened circumstances, and had to cut her naval coat according to her financial cloth. The Land of the Rising Sun has not made the same rapid financial recovery as France did after the debacle of 1870, simply because she has not developed industrially to the same extent as our cross-Channel neighbors, but the Mikado and his Ministers have handled the finances of their country with great skill and judgment and now her most progressive citizens believe she can safely go in for naval expansion. The main object of Japan's "big navy" advocates appears to be to have a warfleet as strong as their Pacific neighbor, the United States of America. If this wish is to be gratified, our little ally in the Far East will have to make a very earnest and energetic spurt in her shipyards—or in ours. The Americans have more money, and more facilities for spending it in their own shipyards than Japan has, but it is to be hoped that no such race will be started. What the best friends of both countries would desire to see is the signing of an arbitration treaty which would relieve the two of them from all thought of any such ruinous competition.

Before the Society for the Study of Military Affairs, Captain Oda made the following criticism of the Japanese Navy.

As a war port Sasebo in the southwest should have a complete offensive and defensive organization; on the coast of Corea Chinhai should protect transports passing the strait; there is no longer any reason for maintaining the station at Maizuru.

In regard to matériel, unity of caliber must be sought for in ordnance. Two arms as distinct as the automobile torpedo and the mine should be in entirely different hands. As for the personnel, officers perform duties that do not correspond to their rank. For example, the prefèts maritimes have not sufficient authority; a lieutenant-commander is a divisional officer, a commander is an ordnance officer or navigating officer, The duties of the graduates of the naval college are not important enough. It is quite possible to make a more profitable expenditure of the money appropriated for the navy.

The Kobe arsenal has received orders to put a new battleship on the stocks, which is to be paid for out of the complimentary funds. It will be similar in type to the *Kawachi* (18,000 tons) and is to be christened *Fuso* after a cruiser stricken from the list of the fleet. It will be built in the 30,000 ton drydock recently completed in this port to do away with the disadvantages of launching. This is the first large ship to be built under these conditions.

The government of the Mikado is at present constructing four *Dreadnoughts*. Three are being built in Japan: anmely, the *Kirishima* and the *Hiyei* at Nagasaki (the latter has not yet been put on the stocks), and the *Harima*, at the Kobe arsenal.

The *Dreadnought* building in England has been christened the *Kongo*. It is a fast battleship of 27,000 tons. The protected cruisers *Chikuma*, *Hirato* and *Yahagi* are being fitted out in the arsenals of Nagasaki and Kobe.

Two new destroyers and a number of river gunboats will be completed this year so as to be put in commission by the end of the present fiscal year.

The Ministry has decided to increase the appropriation for the annual expenditures of the navy with a view to enlarging the war fleet.

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Sevastopol	23.000	St. Petersburg (Baltic Wks.).	Launched June 29, 1911.
Petropavlovsk	23,000	" "	Launched Sept. 9, 1911.
Poltava	23,000	" (Admiralty Yd.).	Launch. July 10, '11.
Gangoot	23,000	" "	Launched Oct. 7, 1911.
1	22,000		Authorized.
2	22,000		"
3	22,000		"

RECONSTRUCTING THE RUSSIAN FLEET.—At last there are distinct signs of a progressive naval policy having been initiated in Russia. Messrs. Vickers (Limited) have booked a contract to build the first Russian *Dreadnought* at Nikolaieff, in the Black Sea, and have undertaken to modernize the shipyard there on the model of the latest British type of equipment. A second order is open to the firm if another company, not named, do not accept similar conditions with another shipyard in the Black Sea. Vickers' firm are now largely interested in shipbuilding operations for Spain, Russia, and Canada. Since the Russian Navy was destroyed in the Russo-Japanese war many difficulties have stood in the way of its reconstruction, and some of these may be enumerated. In the first place, for every officer employed on the active list whose business it was to take the ship to sea when she was built and fitted out. there were six bureaucrats of the

veritable "Tite Barnacle" description, whose generous salaries had to be paid; there was but little work for them to do, but this did not deter them from remaining in their appointments. There is, then, the difficulty about men with whom to man the fleet, and this is really the crux of the whole matter. The Russian fleet has to be manned by land conscripts, with not only no aptitude for the sea, but with an absolute horror of the idea of venturing themselves on this element. Nor is this all. In other countries the training of seamen can proceed day in and day out all through the year, whereas in Russia the Baltic is not navigable for five months out of the twelve, during this time the peasants who are in the process of transformation into sailors are obliged to kick their heels in barracks on shore, doubtless to their own entire satisfaction. No matter how you dress a man, and no matter what you call him, you cannot make him a seaman in barracks; therefore, if Russia is ever to have a navy worthy of the name, she will have to send her fleet out of the Baltic during the winter months, when Generals "Janvier" and "Février" can be trusted to look after the maritime interests of their country.

In 1908 a new naval policy was initiated by the Douma, which decided in commercial parlance, "to cut the loss" of Russian naval ambitions in the Far East, only maintaining there the local naval defences at Vladivostock, agreeing at the same time to keep in the Black Sea a sufficient force to exercise an effective control between the Russian and Bulgarian coasts. Finally, and after much searching of hearts and seeking of guarantees for efficient administration, it was decided to start afresh in the Baltic, not only by a complete reconstruction of the naval establisments, but also by the building of a new fleet. The question then arose as to what class of vessel was in the future to fly the white flag with the blue St. Andrew's cross. The Admiralty, with sound strategic instinct, averred that only ships of the line were of any use. This was met by a section of publicists, and even officers, who declared for a fleet of cruisers, torpedo craft and submarines, capable of waging a defensive warfare in the confined waters of the Baltic, basing their contention on the fact that it would be so long before Russia could once again show a formidable battleship division, that ere that time arrived the might of Germany would be irresistible. So alluring and so economical was this plan that in the first instance it was adopted by the Douma, who voted a million and a quarter sterling for this purpose.

We cannot blame the national assembly for this decision; they had felt themselves bitterly humiliated by the non-success of the navy in the war, and argued—most unfairly if very naturally—that the blame lay with the officers and men of the fleet; therefore if money was to be spent in the defence of the country they preferred to give it to the army rather than to the navy. Those who have read the books of Vladimir Semenoff will remember that this able and patriotic officer laid to the account of the bureaucrats, and the dishonest administration they represented, the fact of the defeat of the Russian Navy. When inquisition was made this contention was proved up to the hilt, and it required the personal intervention of the Czar before the Douma could be induced to do that which has now been done. Admiral Dikof, who did not fall in with the views of the popular assembly, resigned, and was succeeded by Admiral Voyedvosky. This officer resigned, and was nominated as a member of the Council of Empire, his place being taken by his adjutant, Admiral Grigorovitch, who has been appointed Minister of Marine. The relations between Admiral Voyedvoski and the Douma were not of the happiest description, and it remained for his adjutant to persuade the members, after many delays, to vote the necessary credits for the four battleships to be constructed on the Baltic.

The post of an administrator, through whose hands an enormous amount of public money has to pass, is never a particularly enviable one;

al Grigorovitch must be singularly onerous and unpleasant. first instance to clean the Augean stable which has been left in itself would seem to be work enough for one man. He reate new dockyards and arsenals, train up native workmen ships in these establishments, since it has been decided that hip must be built in a Russian Yard. This is doubtless riotic, but the decision having been come to, the Parliament n must be prepared to foot the bill, which will work out ty-five to forty per cent more than is spent in a similar gland or Germany.

on of Inquiry which was appointed last year sent in a report which it was stated that for more than thirty years the for the upkeep of the fleet have been used for purposes ent to those for which they had been allocated; instancing or new construction had been used for the patching up of useless vessels, and further, that the vessels ordered to be t so long upon the stocks that they had to be altered before ached, in order that they might be brought up to date. The h the new Minister of Marine has submitted for the ap- Douma lacks nothing in the way of completeness. It com- battleships of the largest size, five armored cruisers (and cruiser of the present day is nothing but a battleship of eighteen fast torpedo craft of from one thousand to thirteen sixteen submarines, and five minelaying vessels—all for Baltic; and three large battleships, nine destroyers, and s for the Black Sea, the whole to cost 96 millions sterling, ead over a period of ten years, acceleration to proceed year

seems to be fairly certain concerning this program, which oney will not be sufficient. It would be a difficult matter e number of vessels projected, even if the means of con- adequate and conducted economically. As this is not the ma, if it holds to its program, will have to meet consider- "Supplementaries" before the decade expires. There is or this anticipation when we read what has been said in the m in the *Novoe Vremya* by "Brutus." This writer declares all-big-gun battleships of the *Gangut* type, which were to t in forty-five months, and for which the time of completion arried to between four and five years, will, as a matter of ears and eight months to complete; that their cost which was 7 millions of francs, will be 80 millions, or an outlay of 3450 n. If this calculation be correct, it is enough to stagger en we remember that the *Dreadnought*, the experimental ll-big-gun type cost £100 per ton to build, and that the later ewhat in the neighborhood of £80 per ton. If the calculations pations of "Brutus" are correct, Russia will be paying over sterling per battleship.

nostications seem somewhat unduly gloomy, as the first of ass, the *Sevastopol*, was launched on the Neva on June 29; e *Poltava*, on July 10; while the last two, the *Gangut* and nsk, are to be launched on August 28 and October 28 re- s they were laid down in June, 1909, and as at the moment the *Sevastopol* had a displacement of 8230 tons, we might pect that this vessel, at all events, will be completed for sea our and a half years. We are, however, compelled to note he *Andrei Persoswanni*, which was laid down at the Baltic uary, 1903, and the *Imperator Pavel*, begun in the same yard 1903, and which, after alterations that have taken place, are econd half of 1911, beginning their trials! They are of the

Lord Nelson type of the British Navy—or, rather, they approach that class nearer than any other—and it was this class which immediately preceded the all-big-gun type of vessel. They are therefore actually obsolescent before they have begun their trials. In the Black Sea the two battleships of the *Iefstafi* class which have just reinforced the Russian fleet in that sea, have been under construction at Nikolaieff and Sevastopol since 1903.

Russia has viewed with alarm the purchase by Turkey from Germany of the *Kurfürst Friedrich Wilhelm*, and the *Weissenburg*, and is still more exercised at the order by that nation for two *Dreadnoughts* in England. It is plain that if the navy of the Czar is to make head against the Turks it will mean the complete reconstruction of her dockyards in the Black Sea. It is possible, of course, that Russia may, in self-defence, resort to ordering battleships abroad. However this may be, one thing is certain: that unless the new Minister of Marine can make headway against the bureaucracy, can introduce economies—which in plain English means the dismissal of about 50 per cent of the incapables who batten upon the credits voted for naval purposes—and unless he is supported by the whole force of public opinion—such as it is in Russia—as well as by the votes of the Douma, then his mission will be a failure. Admiral Grigorovitch has on his hands the biggest contract of any man in Europe. We admire him for the dauntless courage and enlightened patriotism, which has caused him to take it up, and heartily wish him success in the difficult task that lies before him.—*The Naval and Military Record.*

THE RUSSIAN NAVY.—The silver keel-plates have been laid at Nikolaieff, by Admiral Grigorovitch, Minister of Marine, of the three battleships of which it was announced some time since were to be built for the Black Sea Fleet. This ceremony indicates that difficulties have been overcome, but the keels of the ships will not be put down for some months, though work will proceed with the essential parts in the interim, so that progress may be rapid. The period of construction is stated to be four years, but it is not known exactly what this implies—probably from the present time to the completion of acceptance trials. The shipbuilding concerns on the River Boug have been reorganized, and while one group, that of the Chantiers Navals, is under the control of Messrs. Vickers, the other represents the interests of Messrs. John Brown, of Clydebank. The latter will build two ships to be known as the *Emperor Alexander III* and the *Empress Marie*, and the latter the third ship to be known as the *Ekaterina* or *Catherine*. These ships requiring coal capacity sufficing for the Black Sea, will probably displace 22,500 tons, but will be in every way equal to the new Baltic ships, with some improvements. They are credited with an armament of twelve 12-inch guns and a speed of 21 knots.—*The Naval and Military Record.*

THE RUSSIAN NAVAL DEVELOPMENT.—The first stone has been laid of a great basin at Cronstadt, which is to be named after the heir to the Russian throne, Prince Alexia Nicolaievitch. The basin will be 836 feet 8-inches long, and 35 feet 8-inches deep below the ordinary water level. The Russian Minister of Marine has proposed an extension of the Russian Admiralty yards in the Gabeeren Isles. The land proposed to be acquired, and the buildings to be built, will involve an estimated outlay of 1,080,000*l*.—*Engineering.*

LAUNCHING OF THE "PETROPAVLOVSK."—On the ninth of this month the Czar, surrounded by members of the Imperial family and his Ministers, gave the signal for the launching of the third *Dreadnought*. The ceremony took place amid the salvos of the cruiser *Makaroff's* guns and the enthusiastic cheers of the crowd that thronged the banks of the Neva

The *Petropavlovsk* glided majestically into the waters of the stream, taking its place with the two *Dreadnoughts* already launched and about to receive their armament. Those present received the vivid impression that the Russian fleet would soon occupy a prominent place among the navies of the world.

At the launching, Admiral Grigorovitch, Minister of the Navy, said the following:

"Russia must regain the control of the Baltic, acquired two hundred years ago." These words show an irrevocable determination to contest the superiority of Germany in these waters.

The *Petropavlovsk* is six hundred feet long, and has a displacement of 23,000 tons, and a speed of 23 knots. Its armament will consist of 12 guns of 305 millimeters, and 7 of 120 millimeters.

SPAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
España	15,400	Ferrol.	Building.
Alfonzo XIII	15,400	"	"
Jaime I	15,400	"	Ordered.

TURKEY.

When pitted against a power like Turkey, the powerful Italian pre-*Dreadnought* fleet assumes formidable proportions. Among these ships are the *Emanuele Filiberto* and *Ammiroglio di Saint Bon*, of 9800 tons and 18 knots speed; the *Regina Margherita* and *Benedetto Brin*, of 13,400 tons and 20 knots; the *Regina Elena, Vittorio Emanuele III., Napoli*, and *Roma*, of 12,600 tons and 22 knots speed; and the armored cruisers *Giuseppe Garibaldi, Varese*, and *Francesco Ferrucio*, of 7400 tons and 20 knots. The *Emanuele Filiberto* and *Marco Polo*, which left Taranto on Saturday with sealed orders, were launched respectively in 1897 and 1892. The former has a displacement of 9800 tons, and her main armament consists of four 10-inch, eight 6-inch, and eight 4.7-inch guns. She has two sets of 3-cyl. triple-expansion engines, her machinery having been made in Italy from British designs. The *Marco Polo's* six 6-inch and four 4.7-inch guns are not of recent pattern. Her displacement is only 4583 tons. Italy is well provided with torpedo boats, destroyers, submarine boats, mine-laying vessels, etc., and her navy easily ranks sixth in importance when compared with the other powers.

Turkey only possesses three inferior battleships—namely, the *Torgut Reis* (ex-*Weissenburg*) and *Kheyr ed din Barbarossa* (ex-*Kurfürst Friedrich Wilhelm*), bought from Germany, and the *Messudieh*, built in 1874, and rebuilt in 1904 by Ansaldo. There are several other old ironclads which are belived to be useless or nearly so. The *Hamidieh* and *Medjidieh* are protected cruisers of 3800 tons and 22 knots, built in 1903, the first at Elswick the other by Cramp, of Philadelphia. As the *Morning Post* reminds us, in December 1908, Rear-Admiral Gamble was lent to the Turkish Government, in order to reorganize the navy, but returned to England in February, 1910. He was succeeded by Rear-Admiral Hugh Williams, who is still in Turkey. Little news has been heard of what progress has been made, but it is understood that Admiral Williams' duties are concerned only with thetraining of the personnel, and that he is not naval advisor on all matters as his predecessor was. Turkey recently ordered two *Dreadnought*-class battleships in England, but these are not yet even laid down.—*Pages Weekly, Oct. 6.*

UNITED STATES.

VESSELS BUILDING.

No.	Name. *Battleships.*	Speed. Knots.	Where Building.	% of Completion Sept. 1.	Oct. 1.	Nov. 1.
30	Florida	20¾	Navy Yard, New York.	98.6	98.6	
32	Wyoming	20½	Wm. Cramp & Sons.	77.5	80.	83.9
33	Arkansas	20½	N. Y. Shipbuilding Co.	72.8	75.3	78.
34	New York	21	Navy Yard, New York.	4.5	8.9	[illegible]
35	Texas	21	N'pt News S. B. Co.	3.0	34.9	39.4
35	Nevada		....	Authorized.		
37	Oklahoma		....	"		

The United States Navy Department has given an order for 180 torpedoes to the Whitehead Torpedo Company, and Commodore Volney O. Chase, who has been in command of the torpedo practice ship *Montgomery*, has been detached from that duty and ordered to England to superintend personally the construction of the torpedoes. This is the largest order for torpedoes that has ever been placed at one time by the American Government, and approximately 12 months will be required for their manufacture and delivery.—*United Service Gazette.*

Before a single gun of the 14-inch caliber has been manufactured in the United States, preparations are being pressed forward for the construction of an even greater weapon. Preliminary estimates and other computations for the construction of 16-inch guns for the navy are being made by Rear-Admiral Nathan C. Twining, Chief of the Bureau of Ordnance. It is not expected that the navy will have any immediate use for 16-inch guns, but owing to reports that are current that some other nations—particularly Great Britain and Germany—are working on guns of larger caliber than 14-inch that are now used in the main batteries of first-class battleships of the United States fleet, it is thought wise to prepare to meet any such increase. Admiral Twining is determined not to be caught napping, if, owing to the action of the foreign powers, the Secretary of the Navy should decide that the 14-inch gun is not sufficiently powerful. According to statements emanating from the Ordnance Department of the United States, the projectiles of this new gun will weigh 2400 pounds, and is expected to penetrate the thickest armor plate with the greatest ease, and to burst on the inside of the battleship with the force of about 140 pounds of high explosive. One shot from the 16-inch gun, in the opinion of ordnance experts, would put the largest *Dreadnought* out of effective action, if it did not sink it. In print a 16-inch gun does not appear so much larger than a 14-inch gun, but the weight of a projectile from a 14-inch gun is 1660 pounds, against 2400 pounds for the larger caliber. A 14-inch gun will carry not more than 90 pounds of high explosive, while the projectile of a 16-inch gun will contain between 140 pounds and 150 pounds. Since the 13.5-inch gun is now actually entering our own active fleet, while Germany is said to have started the manufacture of a 14-inch weapon, and the United States purposes mounting a gun of similar caliber in the two battleships recently authorized by Congress, it is not by any means improbable that public opinion in the United States will compel the American Government to adopt a 16-inch weapon. It is even possible that this new gun will form the basis of a compromise between the advocates of two battleships next year and those who contend that one battleship is adequate. It may be decided to lay down an experimental ship carrying 16-inch guns. In this event, however, the completion of such a unit would be considerably delayed owing to the long time which must elapse before the trials of such a new weapon can be completed.—*Naval and Military Record.*

NAVAL OBSERVATION TOUR.—*A Favorable Impression.* Mr. Meyer, Secretary of the United States Navy, who made a recent tour of observation in England, expressed himself as follows on his return to New York:

"I visited two of the largest Government navy yards, three shipbuilding plants on the Clyde, near Glasgow, and the Vickers yards at Barrow. There was a willingness everywhere to furnish information. I had conferences at the Admiralty in London with leading officials on matters of administration concerning the navy yards and the relations of the Admiralty with the fleets. I was attracted by the success in the Admiralty and the British Navy generally in abbreviating and simplifying correspondence, and I shall continue my previous efforts in that direction in our service.

"I found much to learn from the more humane way desertion and leave-breaking are handled and punished in England. I visited the detention barracks at Chatham, under the jurisdiction of the navy, and the barracks at Aldershot, under the jurisdiction of the army. It is at these barracks and similar ones that men are punished for offenses against discipline by continued occupation at drill and useful work during the whole of each day. The punishment periods are short, but a man so punished never wants to go back to it; he is kept so busy.

"No prison garb is worn, and though the men are confined in separate rooms, there is an absence of the brutalizing influence of a prison. I shall make an effort to establish the detention system as far as possible on these lines in the American Navy. A small start has been made in this direction, but much remains to be accomplished, and some legislation along more humane lines will be necessary, and I believe the Congress will be in sympathy with this.

"They are building in England and other countries large, fast armored cruisers of 27,000 tons, and with a speed of 28 knots, with which we have as yet nothing to compare. There has been some talk in our newspapers of a reaction toward smaller battleships in the British Navy, but I found no signs of such a tendency in England, nor any belief that reduction in size would take place in any navy.

"In studying the organization of the British and other leading fleets, I noted that all had the proper number of admirals of suitable rank, while in our country, we have nothing but rear-admirals. I believe we should have at least vice-admirals, if only to give the country proper recognition when our fleets meet foreign fleets at home or abroad."

A Press dispatch from London, under the date of September 16, says:

"Describing his recent visits to British dockyards, Secretary Meyer is reported to have expressed his special interest in the shipyards of Messrs. Yarrow & Co. because of the similarity between the circumstances which caused the removal of this firm's works from the Thames and those which exist today in regard to some of the United States Navy Yards.

"No doubt what Mr. Meyer has seen in England will confirm his views as to the need for closing down certain American yards, and in any case he must have found many arguments in support of such a policy in the history of the British Establishments.

"The reasons upon which the Secretary advocates this reorganization are not only economic, but strategical as well. Similar reasons led to the closing of the British dockyards at Woolwich and Deptford, historic establishments which built the entire fleet of Queen Elizabeth that defeated the Spanish Armada.

"Fifty years ago Woolwich Dockyard had an area of 56 acres and Deptford 38 acres, but both were closed for building, repairs, and docking purposes in 1860-70, Woolwich being allocated to the Naval Ordnance Department and Deptford transformed into a victualling yard and depôt. At one time there were public shipyards also at Harwich, Deal, and Kinsale, but these have now disappeared.

"Similarly, within the last ten years Sheerness and Pembroke dockyards have only been saved from extinction by their use for the building or repair of small craft like scouts and destroyers, neither yard having a dock that could take a modern armorclad. On the other hand the dockyards of Portsmouth, Keyham (an adjunct of Devonport), and Haulbowline (Queenstown), have grown steadily in the same period, while an entirely new yard is being created at Rosyth, on the east coast of Scotland, and a first-class naval harbor has been provided at Dover.

"British establishments abroad have also been reduced in consequence of the new strategical policy of the Admiralty, which substituted fewer and larger ships, able to come home for refit and repair, for the numerous small ships which required expensive dockyard establishments to be maintained abroad for their use and equipment. Among the yards so abandoned or reduced were those at Trincomalee, Ascension, and Port Royal, while the yards at Halifax, Nova Scotia, Esquimalt, and Bermuda are now under the control of the Canadian Government.

"But it is not always the views of naval officers and adminstrators that are carried out, for in England, as in France and America, political influence exerted by those directly interested in the locality affected has stopped the progress of measures intended to promote naval efficiency.

"Such exaltation of vested and private interests over national interests must always be deplored, but the idea that the navy yards exist for the fleet and not the fleet for the yards is a very hard one to drive into the minds of the people."—*Naval and Military Record.*

After visiting foreign navy and shipbuilding yards, Secretary of the Navy Meyer has returned convinced that the Vickers Co., of England in its yards at Barrow-in-Furness comes nearest supplying a model organization for copying in this country. As a result he has sent Captain A. B. Willetts and Captain E. Theiss, U. S. N., to make a more detailed study of the plant with a view to reporting suggested changes in our own organization. In the meantime Naval Constructor Holden A. Evans, U. S. N., has been ordered to Norfolk to assist in carrying out written instructions to the commandant for improvement in the issue and care of tools, handling of material, estimating on work and repairs, and in bringing about uniform methods in all shops. Mr. Meyer has no idea of making any changes in the organization in navy yards.—*Shipping Illustrated.*

UNITED STATES BATTLE PRACTICE.—The battle practice of the American Fleet began with the remarkable firing of the *Delaware* at the *San Marcos*, hits being made at between 15,000 and 16,000 yards, and no ranges less than 16,000 yards being tried. The same vessel was to carry out further firing of the same character, and two ships only were to fire competitively each day. There has also been experimental and night firing, and there was an expectation that by extending the firing over a period of 10 or 15 days rough weather might be encountered during part of the period. It was thought very desirable that the ships should do their work in difficult weather, and when rain, mist, and fog partially obscured the view. The smooth water methods of training have been abandoned, and officers are now required to do their firing in difficult conditions in the open sea. Elementary practice is no longer in vogue, and two battle practices will take place every year. There is to be no firing this year at ranges under 9000 yards. A great deal of work has been done in firing torpedoes in the open sea from battleships, destroyers, and submarines, and results have far exceeded expectations.—*Army and Navy Gazette.*

ORDNANCE AND GUNNERY.

AMERICAN GUNNERY.—The firing at the *San Marcos* and some other circumstances have latterly caused special attention to be directed to the subject of gunnery in the American Navy, which is generally believed to have attained a very high level of efficiency. Excellent results seem to be attained without any very strenuous methods of preliminary training. The principal work takes place on board the ships, it being thought that the close relations between officers and men working under a system of control presents a considerable advantage. An appeal is made to the sporting element in the men, who are stimulated to keen emulation by money prizes and distinctions. The best shooting ship flies a particular flag, and turrets which have done the best shooting have the letter "E" painted upon them to signify "Excellent." Gunnery is constantly practiced on board, and when the men have gained a respectable degree of practical efficiency, the ships undertake further exercises, including calibration, gunlayers' tests, and battle practice. The gunlayers' tests are at a range of about 2000 yards, and the battle practice includes individual firing of ships, followed by divisional firing. The fire is directed in battleships by a lieutenant-commander as "ordnance officer," with a "ranger," "spotter," "tracer," and "sub-station superintendent" as his assistants. The object is to open effective fire at long range, and the lattice masts provide an elevated platform for the work of the ranger and spotter. Usually the captain confines himself to indicating the objects and the times for opening and ceasing fire. What special system of fire control exists seems not to be known. Generally the range being found, say, at 12,000 yards, trial rounds are fired, and the spotter on his platform at a height of about 100 feet above deck indicates errors by observing through proper glasses the fall of projectiles. If the platform should become untenable, the spotter would retire to a secondary station. The ordnance officer, in a central protected station, receives, by voice pipe or telephone, the range from the range-finding officer, and the angle of approach or otherwise from the tracer, and has graphic appliances for recording them. He then transmits the information by voice or optical signal to the stations of the guns. The system is centralized and yet disseminated. Very great confidence is felt in the spotter's ability to observe the fall of the shell, and in the methods of transmitting orders. There seems to be in general no individual firing, all the operations being conducted under a rigid system of fire control.

General satisfaction will be expressed at the decision of the Admiralty to utilize some of the old second-class torpedo-boats as practice targets. They are to be used during night firing, an indication of the importance which the Board attach to this branch of naval training. The boats are being gutted and filled with cork and other material so as to render them unsinkable, while above the upper deck canvas and wooden structures are being erected so as to cause them to resemble the target a modern torpedo vessel offers during night operations. When completed, these targets will be towed past firing ships at varying speeds at night and at different angles of bearing, so as to provide the most realistic practice. The Admiralty's decision suggests the inquiry whether the authorities could not do better than put up to auction the old battleships which are now passing out of the service.—*Naval and Military Record.*

BATTLE PRACTICE.—The illness of Sir Francis Bridgeman and Rear-Admiral Bayly, both of whom we are glad to learn are progressing satisfactorily, has left Rear-Admiral Peirse in command of the First Division while the battle practice is being carried out. It is a coincidence that this should have happened, seing that twelve months ago Admiral Peirse was himself Inspector of Target Practice, and was therefore present during

the battle practice in another capacity. He embarked with his staff, augmented for the purpose, in the cruiser *Hogue*, and likewise his successor, Captain Montague Browning, had the *Euryalus*, a sister ship, under his orders while the fleets are engaged in battle practice this year. It is not until 1910 that the Inspector of Target Practice had a special ship set apart for his use in this way, but the inovation only indicates the extension and development of the scope of his office since it was first established in 1905. This growth was remarked upon at length in one of the chapters of the last issue of the *Naval Annual*, in which the writer showed how, under the guidance of Sir Arthur Wilson, the tendency, already manifest in the time of Lord Fisher, to divide gunnery administration into two branches—making the Director of Naval Ordnance the Board's adviser as to material, and the Inspector of Target Practice the Board's adviser as to technique—had shown a distinct advance. Along this line the office of Inspector of Target Practice has grown gradually but continuously until it has become of great value to the service. With a permanent staff for the purpose, the shooting of the fleet can be analyzed from year to year, and every innovation or change of method or appliance reported upon, while the inspector and his subordinates, who are brought into contact with each captain and his gunnery organization, can collect and co-ordinate the experience of the whole fleet. This data in turn must be valuable to the Ordnance Department which supplies the guns, and to the gunnery schools which train the officers and men in the use of them.—*Army and Navy Gazette.*

NEW METHOD OF FIRE CONTROL.—In the forthcoming battle practice, which is always the chief feature of the autumn work of our home fleets—if all the heavy and light gun competitions have been carried out in the spring, which is usually the case—it is expected that the battleship *Neptune* will be able to give a better account of herself than most of her sister battleships, provided the new Scott's concentrating and rapid-firing gun is brought into operation. It will be remembered that some important gunnery experiments were carried out immediately after the *Neptune* was commissioned for sea service, which demonstrated that a new arrangement had been devised by one of our cleverest gunnery experts, which increased both the rapidity and accuracy of 12-inch gunfire in a marked degree. Improvements have since been made, and it is probable on account of the very regrettable illness of that keen gunnery admiral, Sir Francis Bridgeman, that further trials have not taken place. In the battle-practice test, however, it will probably be found that the system will be used with a view to show its superiority over the old methods of firing, and if it is in the hands of capable experts, as in all probability it will be, then it will have a fair chance of showing how far forward this new arrangement of fire control will carry us. As regards the position in the fleet gained by such advantages, the authorities will probably take care to see that the prizes and credit for good performance are arranged in a manner to secure justice all-round. The important point is to test the new method with the old, and see what ground has been gained.—*Army and Navy Gazette.*

CONCENTRATING GUN FIRE.—We have already dealt with the value of concentrated fire, and given our reasons for holding that the middle-line system of placing the turrets for primary guns will in future be continued in the British Fleet, no matter whether the twin-gun turret be adhered to, or a triple-gun or four-gun turret be eventually adopted by our gunnery experts and designers. There is another important point in connection with getting the most effective gun fire that a ship is capable of, and that is the system by which gun fire is arranged and controlled. It must be confessed that the British system has in the past been in a somewhat unsettled and unsatisfactory condition, owing to the great latitude

ved to the gunnery officers of the fleet in working out their own s—in their own ships—as to the best method to arrange and control fire. Experiments have been carried out in a sort of haphazard man- ever since the *Dreadnought* came into existence, and only reached looked like its climax, and the dawn of a more fixed and better of affairs, during the carrying out of a series of experimental gun- trials in the battleship *Neptune*, shortly after she commissioned, a months back, for her first period in the fighting line.

hile the *Neptune* was experimenting with controlling apparatus for primary guns, it leaked out that Vice-Admiral Sir Percy Scott was on d, and that a system which he had invented had been under trial, had proved highly successful in conrolling gun fire and in increasing apidity and accuracy. The system came through an exhaustive test edingly well, and although there were improvements which suggested nselves as the experiments proceeded, yet the system proved to be a great gain in nearly all directions, over every other system prev- ly tried, that there can be but little doubt that Sir Percy's methods ontrolling and arranging gun fire, from the primary armament, will he one to come into general use throughout the whole of the British t, and so systemize what has been more or less a go-as-you-please, aphazard way of controlling the fire from heavy guns.

at our navy was not alone in lacking a successful and uniform sys- of control before the advent of Sir Percy Scott's method, for the nans, always secretive, have been unable to adequately or effectively eal their methods, and undoubtedly their perplexities have been as ng as ours; and, so far as is known, they have not yet found a gun- admiral to solve this problem as Admiral Scott solved it for the ish Fleet. The Germans adopted a system of firing their primary guns uccession from forward, or aft, according to the direction of the wind, hat the smoke of one pair of guns should not interfere with the firing nother pair; and then, when all the primary guns had been fired, they posed to fire a broadside from the secondary armament. But good as beautiful theory looked on paper, it was found in practice that the sys- n was nothing short of complete failure, for the foremost guns were ays ready to be fired again long before the other primary guns had ir turn. Obviously this system wastes time and prevents the maximum ount of fire being extracted from the primary armament, while the ondary armament never comes into play at all without sacrificing prim- fire.

t takes our bluejackets from 15 to 20 seconds, only, to load a 12-inch n, while a 5-inch or 6-inch gun takes only eight or ten seconds. The l rate of fire which German ships should develop has, therefore, never n approached, and the British Navy stands out as supreme in rapidity d accuracy of controlled fire, as arranged in the *Neptune*. Sir Percy ott's system, which consists of firing broadsides of half the armament, reloped a rate of fire with the 12-inch guns of as much as 20 rounds per nute; and this rate allowed each gun forty seconds to load, which shows it under the most favorable conditions, a better rate than 20 rounds 12-inch per minute from the ship could be developed, as 30 seconds only required to prepare each of these weapons for a second round from moment of firing the first round.—*United Service Gazette*.

GUN ACCIDENTS FROM BACK-FLAME.—Our entente friends have had quite un of bad luck in their naval affairs during the last few years, and this sfortune includes the destructive explosions which caused the loss of o first-class battleships of fairly modern build, the striking of a capital p on the ways while being launched, submarine accidents, and several n explosions which have cost life and limb. The latest of these gun plosions, or to speak more correctly, the explosion of gun-charges near gun, was in the armored cruiser *Gloire* recently, while gun prac-

tice was being carried out on board that vessel. Apparently the gun in which the accident took place was firing at an object that lay dead to windward of the weapon, and so when the breech was opened the wind naturally blew through the bore and forced all the back-flame and noxious fumes from the gases, into the mouths and down the throats of all the men standing in rear of the gun. The back-flame also burnt some of the men, and, worse still, set two gun charges that lay near alight, and caused an explosion which killed three men outright and severely injured 11 others, some of which latter have since died. The gunnery lieutenant was among the injured. Such accidents as this have occurred in nearly all first-class navies, including our own. The precautions adopted in our own fleet now, and which have so far been effective in preventing further accidents of this kind, are, first, to avoid ever having exposed charges in rear of the gun when firing; second, in all large guns to force a strong current of air through the bore directly the gun is fired and before the breech is opened, so as to force all flame and fumes out of the muzzle; and third, with smaller guns to train the muzzle of the gun away from the wind before reloading.—*United Service Gazette.*

ARMOR PLATE MANUFACTURE.—Some interesting figures relative to the cost of armor plate manufacture were given by the Rome correspondent of the *Times* the other day. The Italian Government invited tenders for the supply of 4100 tons of armor plating for the Italian Navy, and as a result the contract was awarded to the Carnegie Steel Company, whose price was 2132 francs a ton. The next lowest tender was that of a French group represented by Messrs. Schneider, who offered to supply the armor at 2465 francs a ton; then came Messrs. Cammell Laird, whose price was 2465 francs; and lastly Krupp, who offered to supply the armor at 2700 francs. It was not stated whether the armor required was of the heaviest class, or only for deck plating; probably it was for the latter or some secondary purpose, as 4000 tons of the thickest armor would not be much more than enough for one vessel. The main point of interest, however, was the securing of the contract by an American firm at a price (about £84 10s. per ton) much lower, not only than the British firm's tender for the same contract, but considerably below the price usually paid by our own Admiralty for armor plate. Supposing the armor required by the Italians to have been for deck purposes, it is conceivable that the Carnegie Company would make an effort to push their new vanadium plates, but no explanation of this kind can be given for the low price of the French tender. The British firm's offer amounted to £105 17s. a ton, whereas it is understood that £120 a ton is the usual price paid for the armor of British vessels. But unless more is known about the type and quality of the armor supplied to the Italians it would be inadvisable to draw too sweeping conclusions on such a matter.—*Army and Navy Gazette.*

A TELESCOPIC SIGHT FOR MACHINE-GUNS.—The importance of fire from machine-guns is generally recognized, but various difficulties have hitherto stood in the way of using an accurate telescopic sight, the principal one being the mirage from the barrel and water-jacket, which affects the telescope more than the open sight. Messrs. Zeiss, of Jena, have now brought out a sight which promises to overcome this difficulty. It is a vertical prismatic telescope with horizontal object-glass and eyepiece, so arranged that the object-glass is well away from the hot jacket. It magnifies only two diameters, and has a field of no less than fourteen degrees. The elevation is given on a circular dial, and the sight can be cross-levelled to eliminate the error which would otherwise result when firing from sloping ground. In view of the importance attached nowadays to machine-gun fire, the new sight should prove a valuable addition to these weapons.—*Army and Navy Gazette.*

DISPOSITION OF GUNS IN DREADNOUGHTS.—*Foreign Navies are Adopting American Center-line Plan.* By Percival A. Hislam.—The total number of ships of the all-big-gun type now built, building, or provided for in the present year is exactly one hundred. Great Britain leads with thirty- (which includes two cruisers building at the cost of Australia and New Zealand), followed by Germany with twenty-one, and the United States with twelve. Japan, having this year placed orders for no fewer than five ships of the type (one building in England and four to be laid down in Japan), has increased her total to seven. Russia, France, Italy and Austria have four ships apiece, none being yet completed, and the last-named power proposes as soon as possible to raise her total to five. Brazil and Spain each possesses three *Dreadnoughts*, two of the Brazilian only being completed; and the list is completed by the Argentine Republic, with two ships on the stocks; Turkey with two recently ordered in England; and Chili with two which are shortly to be placed out on contract.

Of this total of a hundred ships there are thirty-one whose details either have not yet been decided upon or are not yet known. The policy of secrecy, inaugurated by Great Britain with her pioneer *Dreadnought*, has been followed by several other powers. Germany conceals the particulars of her new warships very successfully, and only nine can be spoken of with certainty. Latterly, Great Britain has relaxed the policy, and the only vessels whose details are uncertain are the five of the 1911-12 program. Nothing is known of this year's quintet of Japanese ships except that they will carry 13.5-inch guns; and other ships where similar lack of knowledge exists are the new American vessels to be laid down this year (which, it is expected, will have ten 14-inch guns in two twin and two triple turrets), the last two of the four Austrian vessels, the Turkish and Chilian ships, and the Brazilian *Rio de Janeiro*. The last named vessel was for some time reported to be designed to carry twelve 14.3-inch, fourteen 6-inch and fourteen 4-inch guns; but it has latterly been stated that she will after all be no more than a replica of the *Minas Geraes* and *Sao Paulo*.

In the case of the sixty-nine ships whose principal details are known, there is a very wide divergence in the mounting of the main battery. This would necessarily follow from the fact that some are armed with eight, some with ten, some with twelve, and three even with thirteen heavy guns; but there are also considerable differences even among ships with the same number of guns.

The first *Dreadnought* to be laid down and completed—the British ship of that name—has ten 12-inch guns so arranged as to produce a broadside efficiency of 80 per cent (Fig. 10). Three turrets are on the center line, and so can bear on either beam; but the other two are placed abreast on the beams, so that each can bear on only one broadside. In a broadside engagement, therefore, two guns out of ten would be useless. In spite of the obvious drawbacks of the arrangement, however, it was repeated in six later ships—*Bellerophon, Temeraire, Superb, St. Vincent, Collingwood* and *Vanguard;* and the result is that these seven ships, if they formed one battle unit, would have no fewer than fourteen 12-inch guns out of seventy useless for a line-ahead action.

The seven British ships are the only five-turreted *Dreadnoughts* which cannot dispose 100 per cent of their heavy guns on the beam. The American five-turreted ships *Delaware, North Dakota, Florida* and *Utah* (Fig. 6) have all their turrets on the middle line, with the result that these four ships, mounting ten 12-inch guns apiece and forty in all, are equal in broadside action to five of the British ships mounting fifty 12-inch guns, since only forty of these could be brought to bear on the beam. We are not dealing here with secondary batteries; but the best five of these seven British ships mount ninety-two 4-inch all told (twenty each in the *St. Vincents*, and sixteen in the *Bellerophons*), while the four American vessels

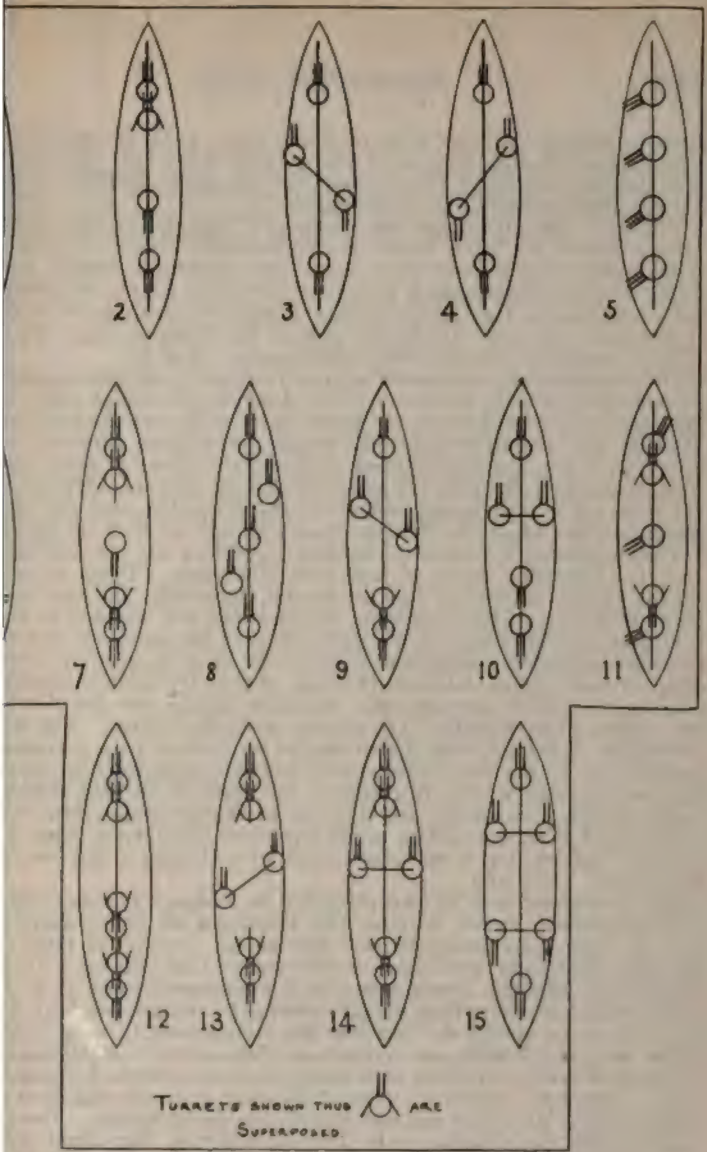
have sixty 5-inch which, allowing for the much greater power of the 5-inch gun, is in all probability a superior equipment. In her later vessels Great Britain began to show signs of being influenced by the full-broadside argument. Its force was, however, admitted grudgingly, and a wavering effort made to combine a full broadside with a heavy fore and aft fire. The *Neptune*, *Hercules* and *Colossus* were the result (Fig. 9). These ships, like the earlier *Dreadnoughts*, have three turrets on the middle line, but the wing pair are placed *en échelon* across the deck amidships, while the last turret but one from aft is superposed to fire over the aftermost. The result is that six guns can be fired ahead and eight aft is superposed to fire over the aftermost. Over a large angle, however, the fire of the port turret is masked on the starboard side by the starboard turret, and *vice versa*, and the lengthy experiments which were carried out in the Mediterranean early this year are believed to have proved that the compromise is not a very happy one.

At any rate it has been abandoned in later ships. The *Orion*, *Thunderer*, *Conqueror* and *Monarch* (1909-10 program), and the *King George V*, *Centurion*, *Ajax* and *Audacious* (1910-11 program), will have ten 13.5-inch guns in five turrets, all on the center line. The second from forward will be superposed, so that four guns will bear forward; and the same arrangement is repeated aft, the fifth turret being amidships (Fig. 7). In these ships, therefore, Great Britain for the first time acknowledges the superiority of the all-on-center-line system which has been applied to American *Dreadnoughts* since the first was designed. The ten 14-inch guns of the *Texas* and *New York* will be mounted on thin plan.

The last of the known five-turreted ships are the Italian vessels *Conte di Cavour*, *Leonardo da Vinci*, and *Giulio Cesare*. In the case of the last two it is possible that the original design may not be adhered to, but they were all designed to carry, and the *Conte di Cavour* at any rate will be equipped with thirteen 12-inch guns arranged as shown in Fig. 11 of the diagram. There will be three three-gun turrets, one forward, one aft and one amidships, and two twin-turrets will fire over the fore and aft turrets respectively. There will thus be a full broadside fire of thirteen 12-inch guns, while five will bear ahead and astern. If this arrangement is not carried out in the other two ships it will be to allow of the mounting of heavier guns. It may be mentioned that the guns in the triple-turrets are arranged on two levels, two being below, and the third above and between them. In this way the breadth of the turret is saved at the cost of additional height.

There are comparatively few four-turreted *Dreadnoughts*. The first were, of course, the American *Michigan* and *South Carolina*, although for various reasons they were not at sea until after the British *Invincible* cruisers. The *Michigans* have eight 12-inch guns in four turrets, two forward and two aft, the one nearer the middle of the ship being superposed in each case (Fig. 1). The British *Invincible*, *Inflexible* and *Indomitable* also have a nominally full broadside (Fig. 3), two turrets being on the center line, and two *en échelon* amidships; but the latter (as in the *Neptune*) are so close together that the arc covered by eight guns is very small. In the *Indefatigable* this fault was to a certain extent remedied, by increasing the distance between these two turrets; but the authorities were finally driven to adopt the American system, and the *Lion*, *Princess Royal* and *Queen Mary* are the result. (Fig. 2). These ships have eight 13.5-inch guns in four middle-line turrets, the second from forward being superposed. Only two guns, therefore, can fire aft, as compared with six in the previous cruiser-*Dreadnoughts* built for the British navy.

The *Indefatigable* system has been followed by Germany in the case of the *Von der Tann* (cruiser), and by Spain in the battleships *España*, *Jaime I* and *Alfonso XIII*. The *Von der Tann* has eight 11-inch guns and the Spanish vessel eight 12-inch; and in each the longitudinal space



ichigan, South Carolina (U. S.), 12-in.
on, Princess Royal, Queen Mary, (British), 13.5-in.
flexible, Invincible, Indomitable, Indefatigable, New Zealand, Australia, British), 12-in.
paña, Jaime I, Alfonso XIII (Spanish), 12-in. Von der Tann (German), 11-in. ngut, Poltava, Petropavlovsk, Sevastopol (Russian): Viribus Unitis, "V" (Austrian); Dante Alighieri (Italian), all 12-in. Plan 3, with tripple turrets, has been suggested for Russian ships.
elaware, North Dakota, Florida, Utah (U. S.), 12-in.
xas, New York (U. S.), 14-in.; Orion, Thunderer, Conqueror, Monarch, King George V, Centurion, Ajax, Audacious (British), 13.5-in.
an suggested by Mr. James McKechnie (of Messrs. Vickers) for 16,000-ton ship fitted with internal combustion engines.
ptune, Hercules, Colossus (British), 12-in.
eadnought, Bellerophon, Temeraire, Superb, St. Vincent, Collingwood, Vanguard (British), 12-in.
nte di Cavour, Leonardo da Vinci, Giulio Cesare (Italian), 12-in.
yoming, Arkansas (U. S.), 12-in.
oreno, Rivadavia (Argentine): Minas Geraes, Sao Paulo (Brazilian), 12-in.
urbet, Jean Bart, France, Paris (French), 12-in.
wachi, Settsu (Japanese), 12-in.; Nassau, Westfalen, Rheinland, Posen (German), 11-in.; Ostfriesland, Helgoland, Thüringen, Oldenburg (German), 12.2-in.

THE DISPOSITION OF GUNS IN DREADNOUGHTS.

between the *écheloned* turrets is much more than in the British ships, while the starboard turret, instead of the port, is nearer the bows (Fig. 4). The British cruisers *New Zealand* and *Australia*, building for Pacific service, are similar to the *Indefatigable*.

The other known four-turreted ships are equipped on the triple-turret system, which has lately come into considerable vogue. All are armed with twelve 12-inch guns, their names and nationality being: *Petropavlovsk, Poltava, Sevastopol and Gangut* (Russian), *Dante, Alighieri* (Italian), and *Viribus Unitis* and a vessel at present known as *V* (Austrian). It has been rumored that in the case of the Austrian ships two turrets will be superposed, but this lacks confirmation (Fig. 5).

Dreadnoughts with six turrets are again comparatively few in number, but present some striking contrasts. The American *Wyoming* and *Arkansas* have twelve 12-inch guns in six center-line turrets, two forward and four abaft of the superstructure. The second turret from forward is superposed, as is also the second from the stern, the object in each case being to increase the volume of fire along the line of the keel. The fourth turret from aft is also superposed above the third, but here the saving of length was the object in view, as these guns do not bear aft. (Fig. 12.)

The only other six-turret *Dreadnoughts* with a 100 per cent broadside are the Argentine ships *Moreno* and *Rivadavia*. These vessels with twelve 12-inch guns have four turrets on the middle line and two *écheloned* (Fig. 13). There has been, and probably will continue to be, much controversy as to which is the more effective arrangement; but the fact remains that the *Wyomings* can cover an arc of 95 degrees on either beam with all twelve guns, while in the case of the Argentine ships this is 10 degrees less. For ten guns the respective figures are 120 degrees and 105 degrees, and for eight 135 degrees and 120 degrees. The Brazilian battleships *Sao Paulo* and *Minas Geraes* have their guns arranged on a similar plan to the Argentine vessels, but the superstructure divides the *écheloned* turrets, which are therefore not available on both broadsides.

For practical purposes the French battleships *Jean Bart, Courbet, France*, and *Paris* are similar to the Brazilian, two turrets being mounted forward and aft (with one superposed in each case), and two abreast amidships. (Fig. 13.)

We now come to a striking variation in design. The German battleships *Rheinland, Posen, Nassau*, and *Westfalen* all have twelve 11-inch guns as their main armament; but they are so disposed in their six turrets that only eight guns bear on the beam. (See Fig. 15.) It was at first thought that this system was due to a misapprehension as to the system of naval tactics which the *Dreadnought* principle involved, but this is hardly borne out by the fact that the arrangement is being strictly adhered to. The *Thüringen, Helgoland, Ostfriesland* and *Oldenburg* are armed with twelve 12.2-inch guns apiece; but the distribution remains the same. Although, therefore, these ships carry as many big guns as the *Wyoming*, the latter is 50 per cent superior on the broadsides. The German vessels, with their twelve guns are no better as line-ahead broadside fighters than the *Michigan*, the British *Invincibles*, or even the 15,500-ton Spanish *Españas*—leaving questions of speed and protection out of consideration.

Curiously enough, the Japanese have also adopted this system, at least for their first two all-big-gun ships, the *Kawachi* and *Settsu*, for the distribution of the 12-inch guns in these ships is the same as that of the 11-inch and 12.2-inch in the German vessels. The average student of the naval war between Japan and Russia will be hard put to it to find any justification for this subordination of the broadside; and it is more difficult to understand since it has been reliably stated that all the data gleaned by the Japanese were placed at the disposal of the British authorities. The same tactical data could hardly justify the *Orion* (Fig. 7) and at the same time excuse the *Kawachi* (Fig. 15.)

Summarizing these details, it will be found that the total number of heavy guns mounted in the 69 ships of the *Dreadnought* era whose details are known is 723, a total that could not have been attained with fewer than 181 ships of the pre-*Dreadnought* era. The ownership of the guns, as well as certain other details, is shown in the following table.

Countries.	Number of ships.	Details known of.	Guns mounted (inches caliber).							
			14-inch.		13.5-inch.		12-inch.		11-inch.	
			Total.	Broadside.	Total.	Broadside.	Total.	Broadside.	Total.	Broadside.
Great Britain	32	27	..	..	104	104	252	238	..	..
United States	12	10	20	20	...	...	100	100	..	..
Germany	21	9	..	..	...	...	48	32	56	40
Italy	4	4	..	..	...	...	51	51	..	..
Russia	4	4	..	..	...	...	48	48	..	..
France	4	4	..	..	...	...	40	49	..	..
Spain	3	3	..	..	...	...	24	24	..	..
Argentine	2	2	..	..	...	...	24	24	..	..
Brazil	3	2	..	..	...	...	24	20	..	..
Japan	7	2	..	..	...	...	24	16	..	..
Austria	4	2	..	..	...	...	24	24	..	..
Turkey	2	0	..	..	...	..	...	...	..	..
Chili	2	0	..	..	...	..	...	...	..	..
Totals	100	69	20		104		543		56	
Number of guns in three-gun turrets			..		...		111		..	
Number of guns in center-line turrets			20		104		407		20	

It will be noted that as the caliber increases so does the desire to place all the guns on the middle line.

THE CATASTROPHE OF THE LIBERTÉ.—The Court of Inquiry will not have completed its investigations before next week. In order to get at the causes of the catastrophe, it is determined to follow up every clue having a practical bearing on the matter and to hear all testimony.

Any attempt at the present time to anticipate the conclusions of the Court would be premature. Such opinions as have so far found their way into print are only hypothetical.

Can the origin of the explosions be placed to the secondary battery magazines with their old-style powder? Is the theory tenable that the fire began in the starboard, forward, 19 centimeter magazines where powder of recent manufacture (AM.) that is, powder containing 8 per cent of amylite, was stored? Finally, can the hypothesis of criminal malevolence be entertained?

The Court is determined to make these points clear, but the task is not an easy one on account of the discrepancies in the depositions of the survivors. The injured are being examined at the hospital and the uninjured are being taken to the wreck to facilitate their declarations. Since the Court is performing its duty conscientiously we should await its report, especially as the Minister will immediately authorize the carrying out of such measures as it may recommend.

At the request of Rear-Admiral Gaschard, Chairman of the Board, Lieutenant de Rothiacob, the admiral's aide and Lieutenant Le Dô, ord-

nance officer of the *Justice*, who were recorders of the Court of Inquiry, have been appointed members.

On the 7th of October the Cabinet discussed the measures to be adopted after the explosion on the *Liberté*. It was decided to create a board to investigate service powder and to propose measures for the storage, preservation, and the supervision of powder supplies. The Board, composed of some of the most competent specialists, will begin its investigations at once and will make the necessary recommendations.

The order to remove from shipboard as soon as practicable all powder manufactured prior to 1902, which applied originally only to the squadrons, has been extended to apply to the schools, the flotillas, and more generally, to all the ships of the navy.

The Minister of the Navy has decided to suppress the third revision of Article 39 of the orders of October 1, 1908, which is the only regulation affecting the preservation of ammunition on board warships. This clause provided for putting back into the magazine after firing, ammunition that had missed fire, etc. Consequently, it will not be permitted in the future to return to the magazine ammunition that has been placed in a gun for firing purposes.

The Minister has also decided to require at all times and in all circumstances the presence on board battleships and large cruisers of a head of department who shall be responsible for the command of the ship. The regulations will be changed to this effect.

The large crane of the shipyards of La Seyne is being utilized for clearing the wreck of the *Liberté*. The wreck of the *Liberté* has been put in charge of the station at Toulon. Commander Baucheron de Boissoudy is in charge of the investigation and the salvage. He has under his orders gangs of workmen belonging to the construction corps, the ordnance department, and other branches of the service. Various effects belonging to the personnel of the *Liberté* have been found in the wreckage.

The roadstead being scattered with débris, divers from the various ships have been exploring its bottom and the dangerous spots have been marked by buoys.

It will take two months and a half to repair the damages done the *République*. The 37-ton armor plate was crushed in on the starboard quarter behind the 30 centimeter turret. In the very same spot, and almost at the same time, a melinite shell from the *Liberté* exploded. The explosion of this projectile undoubtedly explains the breach made in the armored deck. The base of the projectile was found on the deck and the matériel, clothing, etc., which were struck by the shell, show the usual shattering caused by melinite. A curious fact was the unscrewing and dislodgement of the 65 millimeter T. R. gun from its mount between decks on the starboard quarter.

Toulon is beginning to recover its normal aspect. Our private correspondents state that the morale of the officers and crews has not been affected.

Now that everyone has recovered from the stupefaction of the first moments and the funeral rites have been tendered the victims, work has been renewed with the same spirit as before the catastrophe.

The muster-roll of the *Liberté* will be closed on the 20th of October.

As far as possible, all the records destroyed in the explosion are to be restored, such as the liberty lists, muster-rolls, enlistment records, pay-rolls, conduct books, etc. In addition, declarations of the loss of effects have to be taken, indemnities to be paid, the families of the victims to be relieved, etc.

After the explosion of the *Iéna*, many months were required to complete this work, and there are no prospects of a speedier settlement in the case of the *Liberté*.

An authoritative list of the missing has not yet been drawn up for the following reasons: The muster-rolls of the *Liberté* went down with the

and the accounts kept at Brest, a pay station, did not show the most ent transfers. A report of transfers was to have been furnished aboard on the very day of the castastrophe. Consequently it has not been sible to draw up an accurate liberty list.

ince the catastrophe of the *Liberté*, a notable increase in the volun- y enlistments has been recorded. Finistère in particular, has furnished a ge number of young recruits.

MARINE ENGINEERING.

THERMIT. Edited by R. H. D.—The use of "Thermit" for emergency airs in marine service is rapidly increasing. Among the examples of rk recently done by this means are included the repair of the port peller shaft, 10-inches diameter, of the U. S. Engineers Dredge *Gal-ton*, at Galveston, Texas: The welding of an 8-inch crank shaft for Aldrich pump, which was accomplished in three days, using 215 pounds Thermite: The welding of the main shaft of the steamer *Manhanset*, ich was out of commission but eight days for this repair: The repair the stern-post of the steamer *Moses Taylor*, at Cleveland, Ohio, which s completed between the afternoon of August 19 and the morning of gust 23. This break was 8½ x 12 inches in section, and about 725 unds of metal were used in making the repair. The welding of the dder stock for one of the large lake passenger steamers, 12-inches meter, was successfully accomplished in a very short time after cking.

An interesting repair was recently accomplished in Germany, of a some- hat different type from those above: A large horizontal suction gas ngine had broken the outboard jaw of one of its main bearing sockets by back firing; a new jaw of cast steel was cast on to the cast iron frame, without dismantling the engine in any way except to remove the shaft and bearing boxes; this required the use of about 550 pounds of metal and was thoroughly successful, as well, of course, as being much more economical and requiring much shorter time than any other method of repair.

The torpedo tender *Dixie* has used Thermit with success on a number of repairs of various types, and is continuing its use where the work is of a suitable nature.

THE ADMIRALTY AND NAVAL ENGINEERING.—Now that the cadets who entered the naval service under the "common entry and training system" introduced in 1902 are about to attain official rank in the fleet, the Admiralty have issued additional instructions regarding the preliminary work of these sub-lieutenants and the apportionment of officers to special duties in the engineering, gunnery, torpedo, navigation, and marine departments. These instructions, we may say at the outset, do not allay our anxiety, expressed time and again during the past seven years, as to the adequacy of the practical course of engineering embraced in the scheme of training for the specialized duties which develop upon the engineers who have to deal with the extreme complications now common in warships. Resisting the temptation to enter once more upon the subject, upon which nearly all engineers are agreed, we content ourselves here with a consideration of the course now mapped out by the Admiralty for the immediate future.

For the next two years the embryo officer, irrespective of his ultimate function and position in the *personnel* of a ship, will serve afloat. During that period three weeks in every quarter will be served in the engine-room in the discharge of the ordinary duties of a junior engineer officer. For the officer whose later work is to be on the bridge, or on deck, this may suffice, especially as during the past nine years such officers have been devoting a considerable time to study of, and observational instruction in, various mechanical subjects. But for the officer who is, by choice,

or by Admiralty selection, to be responsible for work in the engineering department of the ship in later years, the time stipulated is inadequate. It would seem from the amounts of time devoted to the various subjects that those in authority regard the relative value of the machinery in a warship at 23 per cent of the entire structure. This is so obviously a depreciation of the importance of speed in tactics, to say nothing of other matters in which efficient engineering skill is all-important, that little argument is necessary to prove its fallacy. It is true that, as we shall presently explain, lieutenants selected for engineering duty will undergo a further specialized training; but in this two years' early course there will be consolidated that feeling, which has been suggested for nine years to the mind of young officers, that engineering is of secondary or tertiary importance, and unworthy of permanent acceptance as the subject of a life's work. That, indeed, is one of the strong reasons against the common entry and training scheme. Under it engineering has become a series of little by-paths on the climb up the hill of success in naval life; these are frequented by youths, at the command of the curriculum, for a short period, the main road to the admiral's bridge being always the dominant objective. A youth has always difficulty in concentrating effort until he is certain that he is working towards a definite goal. Indecision as to the ultimate destination breeds indifference.

One year after attaining the rank of sub-lieutenant—a year hence—choice may be made of one or other of the branches of the service; but a definite confirmation, or compulsory selection, will not be made until two years from now. Each officer is to indicate his first preference, giving also his alternatives in order. The authorities will fill up the requirements of each branch, and it may—we should say it certainly will—result that many officers will be appointed to branches, especially to engineering, who have no great ambition in that direction. Time will tell; so that we need not discuss this question, nor enforce the view that the making of a man an engineer against his desires cannot conduce to efficiency in the service. When nominated a lieutenant (E.) he is to attend special engineering classes at Greenwich College for six months. The engineering course at Greenwich has done wonders for the present engineers, but it must not be forgotten that they laid a splendid foundation in their previous training, in which practical work formed a most important part. Following the Greenwich course, a year is to be spent in practical work in one of the dockyards. If successful in examination at the end of this period, the lieutenant (E.) will go into the service as a junior engineering officer afloat, getting 4s. per day. He will be a member of the Military branch, conform to its regulations, and obtain promotion accordingly, his pay as commander becoming 5s. per day.

A few officers will be selected from the lieutenants (E.) to undergo a two years' course of scientific training at Greenwich College and a year at sea in order to provide a flow of engineering officials at the Admiralty and dockyards. Upon proving their ability by examination they become specialists, and will be designated by E.† after their rank. These specialists will be paid 5s. per day as lieutenants, 7s. as commanders, and 7s. as captains plus 5s. as command money. In this case, as with ordinary officers (E.), charge pay, senior engineers' allowance and flag allowance will be paid as at present. The specialists will serve in ships if no shore appointment is available. Captains (E.†) may be promoted to flag rank, but will not take command of sea-going ships or fleets.

These specialists, as well as the ordinary officers (E.), may, on passing the examination for commander, leave the engineering branch of the service and take up deck duties. Here, as throughout the whole system, there is displayed a complete lack of appreciation of the importance of ripe practical experience in the engine-room. It is notorious that in the past the "loaves and fishes" have gone to the military officer. The Admiralty have encouraged this by the abundance of distinctions, decorations

other honors conferred on the military officer, and by the neglect of engineer when such recognition was made for faithful service. When nguished visitors are received the engineer is forgotten; this is a ll affair, but it is not without its effects. There are, too, many allow- s to the navigating and bridge officers in pilotage money, etc., which rially increase their emoluments. And, finally, there is the higher , and the possibility of winning glory in the command of a ship or et. These superior inducements of the military branch will be ever nt to the engineering officer, especially if he has been forced to enter department at the outset of his career as an officer afloat. His am- s eye will, therefore, always be on the bridge, and thus it will event- that the engine-room will be for him "no continuing city," and he be reconciled to his immediate surroundings only by the probability service in the engine-room efficiently done will count in the pro- n to that sphere which is higher, according to the world's opinion e deck branch.

e advancement of the most efficient lieutenants (E.) or lieutenants to commanders in the military branch will so seriously affect the inery department as to be disastrous for the service. One has only to t upon the great advance in marine, and especially naval, engineering g the past ten years to realize the enormous value of practical ex- nce, as well as wider scientific knowledge, if the best is to be achieved these improvements, and particularly if probabilities of breakdowns o be anticipated on the spot. If, then, upon winning experience, men o be permitted to desert the engine-room and to deplete the staff best officers, grave results must follow. The engineering profession honorable and as worthy of recognition as any other—fuller of st than even the military branch of the navy—and upon it depends uccess of the fleet in peace and in war. "The man behind the man d the gun" can win or lose actions, and once an engineer always an eer should be the rule. We can see no justification for this practice st training officers as engineers and, when they are in the position ply experience, to allow them to pass to another branch of the ser- where their special experience is inapplicable or of little avail. The is contrary to all the tenets of a successful commercial nation. If ngineering work is not as popular as the military branch, the remedy with the authorities, and we have indicated some directions in which disparity may be lessened if not removed. The first step should be one qualize the conditions of the present engineering officers with the nt military officers.

e are encouraged in the hope that the Admiralty will yet see their to prevent this desertion of the engineering branch by the amend- ts they are now introducing in the case of marine officers. Here the ntion was to make the marine not only co-equal with the others, but ermit the officers to pass at a certain stage of their career into the ral naval service. This is changed. A lieutenant (R.M.) will, as a , remain attached to his corps throughout his career, gaining pro- ion as in the military branch. Only in certain cases can he pass to military branch, and then solely at a later period in his service. Since breach in the scheme has been made, there is hope that it will soon pplied to the engineering branch; the sooner the better for the navy. eover, when it appears as if there would be a certainty of a paucity olunteers for the marine branch, a certain number of applicants are to eceived into the branch without passing through Osborne and Dart- th, a special course being provided for such. Here the principal of mon entry and training is departed from. We do not blame the orities. To profit by the teaching of experience is, on the contrary, seworthy. We hope the profit will yet extend to the engineering ch—*Engineering*.

ELECTRIC DRIVES FOR SCREW PROPELLERS.* By H. A. Mavor.—The problems of marine engineering have until recent years been solved exclusively by the application of various forms of the reciprocating steam engine, and the power, speed, form, and general arrangement of power-driven vessels have been developed in connection with this means of propulsion. The advent of other appliances has opened up new lines of development, and in certain departments there is evidence of need for intermediate devices between the power-producing and the power-absorbing elements.

The necessity for these devices arises when the properties of the propeller in respect of rate of revolution are incompatible with those of the power-generator. This incompatibility is most conspicuous in vessels which have to operate at relatively slow speeds. An examination of the conditions which have emerged in the development of marine propulsion soon shows that the incompatibility is not accidental, or due to imperfections in the design, construction, or use of the propelling equipment, but that it is associated with the essential properties of the substances and appliances with which we have to deal.

It may be said in general terms that high efficiency is associated with low rate of revolution of the propeller, while in the steam-turbine high rates of revolution are essential to the most economical use of the steam. Internal-combustion engines have speeds more nearly approximating those of reciprocating steam-engines, but here also there is a tendency to speeds higher than are convenient or economical from the propeller standpoint.

In addition to those fundamental incompatibilities arising from causes out of the reach of direct accommodation, there are other conditions which limit the direct application of engine to propeller. The draft, beam, and form of the vessel limit the area of the propeller. The traffic for which the vessel is designed influences the determination whether one, two, or more propellers are to be used, and the speed, size, and form of the vessel determine limits to the designer's choice. All these considerations taken together frequently fix the diameter, pitch and thrust of the propeller, and within very narrow limits, also the rate of revolution. Now this rate of revolution is not always the most favorable for the power-generator, and the designer is in such cases compelled to resort to new expedients if he is to attain the standard of efficiency in power generation which has been set by the results attained on land. At the present moment the economy of power production in the best practice on land is considerably in advance of what has been done at sea. The principal reason for the better economy of the land work is the higher rate of revolution of the power-generator when untrammeled by propeller conditions. There are cases where the special limitations in respect of dimensions and weights permissable for the machinery are such as to preclude the use of any intermediate mechanism between the prime mover and the propeller.

In a ship whose voyage is short, whose speed is high, displacement small, and the propeller efficiency as good as is attainable, and the quantity of fuel carried small relative to the weight of machinery, the possible economy in fuel may be insufficient to warrant any increase in the weight of machinery; or, to put the case otherwise, it is advisable to sacrifice economy in fuel to keep down the weight of the equipment—*e. g.*, a vessel running one-day voyages, and burning 50 tons of coal, could not possibly submit to an increase in weight of machinery in excess of the coal-saving, because such increase would increase the displacement and the power necessary to drive the vessel. If, on the other hand, the vessel makes a 10-day voyage, and the saving in fuel carried amount to 10 tons per day, a considerable increase in weight of machinery might be associated with decreased displacement and a substantial all-around economy.

* Paper read before Section G of the British Association at Portsmouth, September 1.

Various methods of making the required adaptation of generator to propeller are at present under trial. For this mechanical gearing by toothed wheels or hydraulic transmission may be considered serious competitors with electric transmission, but for large powers it seems reasonable to expect that electric transmission, which is already developed for this very purpose on land, is likely to find an equally useful field where the conditions are such as to require an intermediate device at sea.

The cost, weight, and efficiency of electric transmission compare favorably in the examples which have been examined with either of the two competing methods. There are other important qualifications of electric transmission in which it stands altogether unrivaled. The most important of these qualifications are: It provides a ready means of reversing the direction of rotation of the propeller without changing the direction of rotation of the power-generator.

The electric transmission also provides means for changing the speed ratio between generator and propeller, so as to permit of the power of the generator being developed under the most fovorable conditions at all speeds of the ship.

Lastly, it provides means for applying the power of one or more engines o one or more propellers, so that the power-generating units may be so lisposed as to give the highest efficiency, and when they are not required hey can be stopped. These properties of the electric transmission supply xactly what is required to render steam-turbines, and also internal-comustion engines, completely adaptable to the purpose required. Both types f power-generators give their best efficiency when full speed of rotation s maintained, even when running below full power. It is, therefore, adantageous to keep the engine revolutions within the range of governor ontrol, while the required speed change is accomplished by electric cominations.

The properties of the electric motor lend themselves well to the requireents of maneuvering. The rate of reversal is under perfect control. he possibilities of rapid and certain action are more than attainable in reciprocating steam-engine connected direct to the propeller, and the lectric motor is applicable to powers for which there is no possibility of sing anything in the nature of reversing gears or clutches.

The property of combining the power of more than one engine for pplication to one or more propellers is the special feature of the author's ventions as distinguished from the ordinary methods of electrical enineering. Engines of different types, sizes, and rates of revolution can ave their powers combined without interconnection of their electric ircuits, and without risk of mistake or error. An oil-engine at 100 revotions may be running the vessel at slow speed, and a steam-turbine runing at twenty times the speed may be jointly applied to the propellers ithout any complication of the electric equipment. Each unit does its wn work independently.

The advantage of such an equipment in vessels which are required to perate under varying load conditions is evident. Without subdivision f the power units the whole of the main machinery must be in motion hile the ship is in motion. At speeds reduced below its normal rate of evolution the steam-turbine is even less economical than the steam-engine. ubdivision into high-pressure, low-pressure and intermediate elements as been carried out in certain steam equipments, but this result in a omewhat complicated and inconvenient system of piping, because the team has to be led from one part of the system to the other across the essel. In the electric system each unit can be self contained, and disosed in the manner best suited to a convenient arrangement of the engineoom. The size of the individual units can be adjusted to suit the powers equired at the different working speeds, or they may be duplicate.

A few examples of application of the system are here presented, together with a description of a small vessel built to demonstrate and illustrate the principles of operation and to provide experience in the use of the plant. In all cases alternating 3-phase currents are used, and interlocking devices connect mechanically the main reversing switches with the existing switches, so that no change can take place in the connections while they are passing currents.

Description of the Turbo-Electric Steamship "Frieda," for American Owners.—This vessel has been specially designed for the transport of [illegible] freights between the Gulf of Mexico and New York City. The vessel is to be 300 feet long, and will carry a dead weight of approximately [illegible] tons, at a mean loaded speed of twelve knots at sea. The propelling machinery is aft, and consists of a turbo-electric outfit for 1500 kw. three-phase 50 cycles when running at 3000 revolutions per minute. The turbine is supplied with steam at a pressure of 200 pounds per square inch at the turbine stop-valve. This electric generating plant is arranged on foundations on a platform deck in the engine-room, and the condensing plant in the engine-room hold. The condenser is fitted with a vacuum augmenter, and is suitable for dealing with the full-load quantity of steam from the turbine. The vacuum obtained will be 28½-inches, with cooling water about 85 degrees Fahrenheit. This condensing plant consists of a vacuum condenser, three-throw air-pumps, and a centrifugal circulating pump with electric-motor drives. The current is led to a three-phase motor, which is keyed direct to the main propeller shaft, and is capable of developing 1900 brake horse-power at a speed of about [illegible] revolutions per minute. The steam is generated in two Scotch boilers, with Howden's forced draft, and liquid-fuel burners. This installation costs and weighs less than the normal equipment. The coal saving is over 10 tons per day. The design of the ship itself presents many other novel features. This design was prepared by Messrs. John Reid & Co., 17 Battery Place, New York City.

Oil-Electric Tank-Barge for Canadian Service.—In this the system is applied to the propulsion of a 245-foot Canadian canal-type tank-barge for the Standard Oil Company of New York. The equipment consists of three separate units of Diesel non-reversible oil-engines, each capable of developing 200 shaft horse-power, each directly connected to an alternating-current generator. The currents from one or all of the units are led to the separate windings of a three-phase motor, keyed to the main propelling shaft, and operating a single slow-turning screw. The great advantage and economy of this system consists in being able to run at full power or at one-third power using one or three engines at full-load economy at will, thus providing for an economical operation impossible with any other propulsive system. The fact that non-reversible oil-engines are used running under governor control greatly simplifies the maintenance and operation. The control is operated by a low-tension interlocking switch, operated by an ordinary engine-room telegraph-stand located in the pilot-house, so that the maneuvering of the vessel is at all times in the hands of the navigating officer. This equipment increases the cost of the ship about 10 per cent above the normal, but the carrying capacity is very largely increased.

Marine Turbo-Electric Installation Proposed for United States Navy Colliers.—A marine turbo-electric installation has been submitted to the United States Navy Department for adoption in one of the four large colliers recently given out to contract. The installation consists of a steam turbo-alternator of 5000 kw., with condensing plant; the current is led to two motors, one being keyed to each propeller shaft. The machinery is right aft in the vessel. The steam is generated by Scotch boilers. The vessels in which it is proposed to install this machinery are 525 feet long, and will carry a dead-weight of 12,500 tons of coal at a speed of 16 knots

at sea. Here, again, the cost, weight, and economy are better than can be shown with the normal reciprocating-engine equipment.

In the course of a summary of the principal points involved in electrical propulsion, Mr. Hobart remarks that a study of the circumstances reveals a remarkable accordance of means and requirements. "It has come to be recognized that a very important advantage of the electric drive as applied to ship propulsion, relates to the independence which it provides between the prime movers and the propellers, for instance, a triple-screw ship no longer requires to have just three engines. Four engines, or two, or some other number, may be more suitable. If four engines are employed, while only one may be required to be in service at cruising speed, nevertheless each of the three propellers will be driven by its own electric motor or motors. Thus it may readily be arranged that whatever machinery is in operation shall be carrying its most economical load. Appreciation of the importance of this feature (which is exclusive to the electric drive and is not provided by any of the mechanical speed-reduction methods) has caused engineers to consider with increased interest the merits of the internal-combustion engine as a prime mover for ship propulsion, and it is seen (when employed in connection with the electric drive) to be a very promising alternative to the turbo-electric drive."

"It would appear that the addition of the electric drive will save the situation for the steam turbine, and also for the internal-combustion engine, so far as relates to their application to ship propulsion. In addition to the attributes already mentioned, the electric drive at once provides for astern running without any of the complications, difficulties, and expense otherwise encountered in connection with astern running when the prime movers are other than reciprocating steam engines. One of the most notable features of the electric drive relates to the greater precision afforded during stopping or quickly reversing or sharply altering the course of the ship. In these operations, no other means can approach the power and precision inherent to the electric drive."

Mr. Hobart further remarks that the British Admiralty stands alone in the adoption of the policy of equipping all battleships and cruisers with steam-turbines. "In the German Navy and in the American Navy, steam-turbines have been employed to only a very limited extent, and, so far as relates to battleships and cruisers, appear to be regarded as inherently inferior to the piston engine for the purposes of marine propulsion. The inclusion of the feature of the electric drive will eliminate from the steam turbine proposition the inherent disadvantages which otherwise attend its use, and, in large sizes, will place it in the same position of unchallenged superiority over the reciprocating steam engine which it already occupies in land practice."

"For constant speed operation, the mechanical methods which are now being successfully exploited by Westinghouse, Parsons and Föttinger, are admirable. But for astern running, the last mentioned alone shares with electrical systems the advantage of dispensing with the necessity of reversing the prime mover, and (in the case of steam turbines) of providing auxiliary prime movers. None of these three systems comprise any feature endowing them with any such perfection of control in maneuvering or in prompt stopping, as can be provided by the electrical method. Moreover, it should not be overlooked that *all* ships are, on occasions, required, as when in crowded harbors and during foggy weather to proceed at other than their normal speed. The mechanical systems cannot approach the electrical system in the matter of economy at other than maximum speed, and the superiority of the electrical system is very considerable for ships

which must frequently proceed at speeds much below their maximum speed. For strictly constant-speed ships, a good case can, however, be made out for the use of mechanical gearing, as it should usually show higher efficiency and lower first cost than the equivalent in electrical machinery. As already mentioned, however, the mechanical method is at a disadvantage in requiring auxiliary turbines for reversing, and in affording a less powerful and exact command of the boat in all maneuvering operations."

In the volume referred to will be found a very instructive account of the Melville-Macalpine Föttinger and other mechanical speed-reduction gearing, chapters on the use of superheated steam in marine engines, electrical gear as a means for improving the load factor, internal combustion engines for ship propulsion, etc. The chief credit for recognizing, in its wide bearings, the load-factor advantages associated with the electrical propulsion is assigned by the author to Mr. Henry A. Mavor, who has for several years devoted a large amount of study and investigation to the application of electricity to ship propulsion. Mr. Mavor's proposals are examined in great detail together with those of Mr. William P. Durtnall, W. L. R. Emmet, and others, including the Mirrlees-Day system. It is essentially a work which should not be missed by anyone desirous of following up this important development of the practical side. Unless we are very much mistaken it is a work which marine engineers have been literally waiting for, and armed with the data now provided they should be enabled to return to the complicated problems involved with renewed ardor.—*Pages Weekly.*

MOTOR-DRIVEN WARSHIPS.—Some time ago, when considerable discussion was going on regarding a supposed motor battleship which was "to appear shortly," but has not yet been heard of, we pointed out that it would be a departure from all precedent if the Admiralty installed an experimental set of marine engines in so large a vessel as a battleship; and that it was much more likely that we should have a motor-driven torpedo craft as an experimental ship. Our prophecy has turned out to be true, for we now have it on good authority that Messrs. John I. Thornycroft, of Southampton, are building a destroyer for the Admiralty which is to be driven by a Diesel oil engine, in lieu of cruising steam turbines. As we mentioned in the *United Service Gazette* last week, a two-cycle Diesel engine of, it is said, 6000 horse-power is being made by Messrs. Vickers for their Lordships, which is to be installed, for experimental purposes, in a twin-screw cruiser of the old type, displacing one of the steam engines and working side by side with the other. It is fitting that Messrs. Vickers should be given the larger job, since the success of the only motor-driven vessels of any size in the British war-fleet, the submarines, has been beyond question, and they have been built solely by this large company, aided during the late years by the Royal dockyard at Chatham. Vickers, by-the-way, are adding large administrative and other offices to their already huge premises, and the development of the marine motor is receiving close attention from this enterprising firm.—*United Service Gazette.*

The trend of engineering progress is shown from an exceedingly broad and withal unbiased viewpoint, in the recent report of the chief engineer of the British Engine, Boiler and Electrical Insurance Co. on breakdowns of various types of machinery insured by them.

The commercial engineer presumably knows all about the weaknesses of his own designs, and to a certain extent he is cognizant of the failures of other designers in his own field, but there his information usually stops short. However, an insurance company being in a sense a disinterested party, in that he has no interest in the competition between designers, and on the other hand being the first party to be informed of

ures in the apparatus covered by its policies, is in a peculiarly favor- position to obtain much information of great general interest to the neering profession at large.

he above-mentioned report shows the marked progress in gas en- development. The statistics given indicate that out of every forty- engines now insured, 20 are gas engines. The figures also show that of every 9.7 steam engines insured had some sort of failure during year, while only 1 in 10.8 of the gas engines was similarly reported. se figures are, however, doubtless rather misleading, as the steam nes will in the majority of cases be shown to be considerably older the gas engines and so a large number of the steam-engine break- ns may be charged to worn out parts instead of faulty construction efective material, which are the most fruitful causes of trouble in gas engines. This is shown conclusively in the appended summary in which the causes of trouble are roughly classified:

	Steam Engines.	Gas Engines.
dents and other undetermined causes......	37%	35%
defects, wear and tear, etc................	34%	29%
knesses, bad workmanship, poor design or terial	16%	19%
igence of owners or attendants...........	13%	17%

mmenting on the table above, the report says that while the pro- on of failures to the whole number of engines insured is gradually easing, there is an increasing number of failures which are due to kage of small parts, valves, gearing, etc., which seems to show are wo things: either the larger, more important parts are being more fully designed, strains being figured from theoretical considerations the problems of design being more thoroughly analyzed instead of decided by rule of thumb in comparison with the smaller parts, which more frequently than not, merely made to "look right;" or on the hand, the general design may be changing in such a way as to make small parts which are susceptible to failure in one manner or another. quite presumable that a combination of these two factors may be eal explanation of the change noted in the character of the failures ded.

e number of boilers insured is gradually decreasing, due no doubt rt to the increase in the number of gas engines, but also to the in- e in size of units. Inasmuch, however, as a large proportion of the rs insured are of low pressure types, the boiler information is of interest to marine engineers.

e tendency toward the use of alternating current apparatus for shore is shown by the increase in number of alternate current machines ed, which now number 14.5% of the total insured.

wo causes of trouble are especially mentioned and warned against e is the practice of leaving exposed cable ends on uncompleted work, h may become grounded and throw heavy overloads on the machines. other is the practice of coupling up the leads on enclosed or semi- osed apparatus with so-called dry joints, *i. e.*, joints without solder. insurance company finds that the resistance caused by such joints uently overheats the wires and sets fire to the insulation, which of se very promptly causes much more serious trouble.

OTES ON OIL ENGINES. Edited by G. J. M.—The oil engine in its ent state of development is of several types. It has, however, been ght into prominence by the success of the Diesel engine, and conse- tly it is of interest to know why this type of engine has been suc- ful.

The alteration of the design of the gasolene engine represents type of the heavy oil engine. The alteration was made to utilize the oils, and the oils that are by-products of refining and that have no commercial use except as fuel, and consequently are comparatively cheap, in price from two to five cents per gallon depending on the locality transportation facilities.

The preparations of these heavier hydrocarbons for use in the consists essentially of vaporization and mixing. In one case, this is effected during the compression stroke. The oil is injected incandescent hood or chamber, which for starting is heated up by means of a lamp, and afterwards kept hot by the combustion of mixture in it. During the compression stroke, air from the cyl rushes through the contracted opening into this chamber and mixes

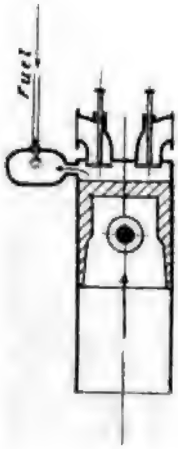


FIG. 1.

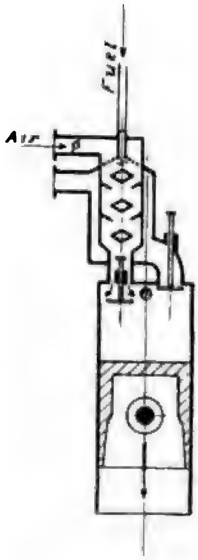


FIG. 2.

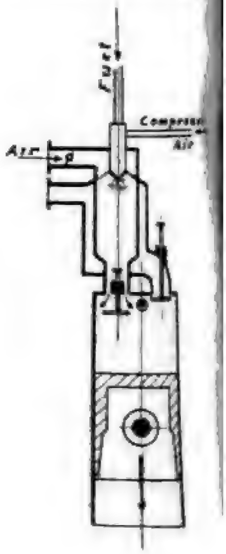


FIG. 3.

the vapors therein, until the end of the stroke, the right proporti combustible to air is reached. The mixture is then ignited sim direct contact with the hot walls of this vaporizing chamber, aug slightly by the heat due to compression.

Another is shown in figure 2. The vaporizer chamber is provide a jacket space through which the exhaust gases pass, thus heati vaporizer externally. A cloud of fuel vapor is produced by droppi liquid fuel on the heated surfaces of the baffle plates inside the va On the suction stroke of the piston, free air enters this vaporizer passing over the baffle plates, becomes heated and in the sam absorbs the oil vapors; the mixture thus formed and pre-heate enters the cylinder and at the end of the compression stroke is by the electric igniter.

A third case is shown in figure 3. The fuel oil is mixed wi broken up by a stream of compressed air of from 8-25 pounds p above the atmosphere, so that it enters the vaporizer chamber in th of finely divided spray, and is immediately vaporized, due to th

ted externally by the exhaust gas. The bulk of the air, being as- ted during the suction stroke, then mixes with the fuel vapor and mes pre-heated, thus forming the explosive charge. Compression ignition are the same as in figure 2.

ese types of oil engines, especially those of figures 1 and 2, are simple and therefore cheap in first cost. Their method of vapori- n, however, is rather crude and gives rise to objections well borne by practical experience, which are the cause of the prevailing preju- against such oil engines. The chief drawback to all these vaporizers e practical impossibility of vaporizing the fuel completely at all loads under all conditions. The heat of the chamber should always be high gh to vaporize all the oil, but never hot enough to decompose it, deposit of carbon will be formed in the vaporizer and cylinder, ac- anied by incomplete combustion and therefore low efficiencies; this fests itself by the objectionable smoke and odor of the exhaust . Another drawback is that in all engines of the type of figure 1, der to obtain certainty of ignition and at the same time prevent gnitions at different loads, the temperature of the vaporizer should with the load, a practical impossibility. The pre-heating of the ure, as required for engines operating under the principles shown gures 2 and 3, decreases the weight of the air aspirated, and therefore capacity of the engine; while the throttling of the air in passing ugh the vaporizer chamber and passages, as well as the high back ure due to the exhaust gases passing through the jacket space of the rizers, decreases the power output of such engines still more. The ssity of first heating the vaporizer externally by means of a lamp re the engine can be started is rather inconvenient as it takes at least to ten minutes. The fuel consumption of these engines averages t 1 pound of oil per b. horse-power hour, corresponding to a thermal ency of not over 15 per cent.

ese three types cover in a general way the mechanical principles of of the commercial liquid fuel engines today on the market. A t variety of modifications is possible, but they all have in common the that the fuel and air mixture after having being compressed, is in taneously ignited; that is, at constant volume, and according to this e of heat application they belong in the class of constant-volume en- s. The degree of compression is limited with the thermodynamic e on account of the danger of premature ignitions due to the com- sion temperature, and hence the efficiency is limited. Without arti- l means (which have been found to be impracticable) the safe limit compression in the present constant-volume oil engines has by long rience been found to be about 60 pounds in kerosene engines, with taneous ignition. The efficiency of these types of engines is not y therefore, to be increased in the near future beyond about 15 per . Considering this, as well as the undesirable features touched upon re, it is quite obvious that as far as reliability and economy of oper- n are concerned, these engines fall far short of what may be reason- expected.

he Diesel type of engine was invented with a view to overcoming e difficulties. The inventor instead of constructing an engine and icing a theory from it, laid down the working principles which might rn any improvement in the oil engine, and then proceeded to put them ractice. These principles may be stated as follows:

Production of the highest temperature of the cycle, not by and ng combustion, but entirely by mechanical compression of air.

Gradual introduction of a small and well regulated quantity of finely ded combustible into the highly compressed and heated air, in such a that no further increase of temperature takes place but all the heat rated is carried off by the expansion of the gases of combustion during working stroke.

3. Introduction of a large quantity of air in excess, instead of admitting only as much air as is required for the combustion of the fuel.

Many refinements and improvements have been made since the first engine was built. Instead of the single stage air compressor direct connected to the engine, such as was used in the first engines, the present practice is to use a separate two- or three-stage compressor either belted to the engine or driven by a motor. The first stage of the compressor delivers air at 75 to 150 pounds and this is stored in steel accumulators. The second or second and third stages compress the air to 900 to 1000 pounds and it is then stored in accumulators and used for spraying the fuel in the cylinder.

The operation of the present Diesel engine is as follows:

Air is drawn into the cylinder during the suction stroke, and compressed during the compression stroke to 500 to 800 pounds per square inch. The temperature of this air due to compression is from 1000° to 1200° F. At the end of the compression stroke, the fuel is introduced in the form of a spray by the combined action of the fuel pump and the high pressure air. The fuel does not explode, but burns, simply because of the heat of the compressed air, there being no other means of ignition. Since the oil particles are burned immediately after their admixture with the air, there is no possibility of deposits forming on the cylinder walls and combustion is so complete that the exhaust products are entirely smokeless and without odor. The fuel pump continues to introduce the fuel during one-tenth to one-eighth of the working stroke, with the result that the pressure in the cylinder during this part of the stroke is constant. Hence the term constant-pressure engine applied to this type. Governing is obtained by regulating the amount of fuel fed into the cylinder by the oil pump. Numerous tests made on Diesel engines of different sizes show an average fuel consumption of less than 0.5 pound of oil per b. horse-power hour, corresponding to a thermal efficiency of about 30 per cent.

To the particular feature of compressing air alone to such a pressure and temperature that it will immediately vaporize and ignite the fuel injected into it, the constant-pressure engine as embodied in the Diesel type undoubtedly owes its success. It lends itself admirably to the utilization of liquid fuels, as it does away at once with carburetors or vaporizers and igniters; moreover it allows the burning of any liquid fuel without special accessories. Another point of equal importance is the fact that with decreasing loads the efficiency of the constant-pressure engine decreases but very little, while that of the constant-volume engine drops very rapidly with lighter loads.

In view of these points, therefore, there can hardly be any question that for the utilization of liquid fuels the constant-pressure engine is far superior to the constant-volume engine.

In a Diesel engine, figure 4 represents the period where a measured quantity of fuel, according to the load on the engine, is being deposited in space *s* of the injection valve cage *c* by the oil pump *o*, the injection valve *n* being closed at that moment. Space *s* is continuously in communication with the air storage tank *t*, into which the 2-stage air compressor *a* delivers the air required for fuel injection at a pressure of from 750 to 1000 pounds. (One or two additional tanks are automatically kept charged by the compressor with air of about the same pressure for starting the engine.) The oil must therefore be delivered into space *s* against this high pressure which, in view of the small quantity to be delivered, requires extremely accurate work and adjustments on the oil pump *o*. Since fuel and injection air come into contact with each other while injection valve *n* is still closed, that is, before the actual injection period, it is quite obvious that the valve cage *c*, as well as the injection air, must be well cooled in order to prevent dangerous premature ignitions or the formation of deposits due to partial evaporation of the deposited fuel.

ıre 5 shows the actual injection period, which starts as soon as in-
ı valve *n* opens; the latter therefore controls simultaneously the ad-
n of fuel and the injection of air into the cylinder. At all loads
oints of opening and closing of the injection valve *n* remain
ıged, that is, the length of the period the injection valve is open
stant. Within this period a variable quantity of fuel, according to
ad, is to be injected. In order to accomplish this most satisfacto-
has been found necessary to increase the pressure of the injection
th increasing loads on the engine, that is, with increasing amounts

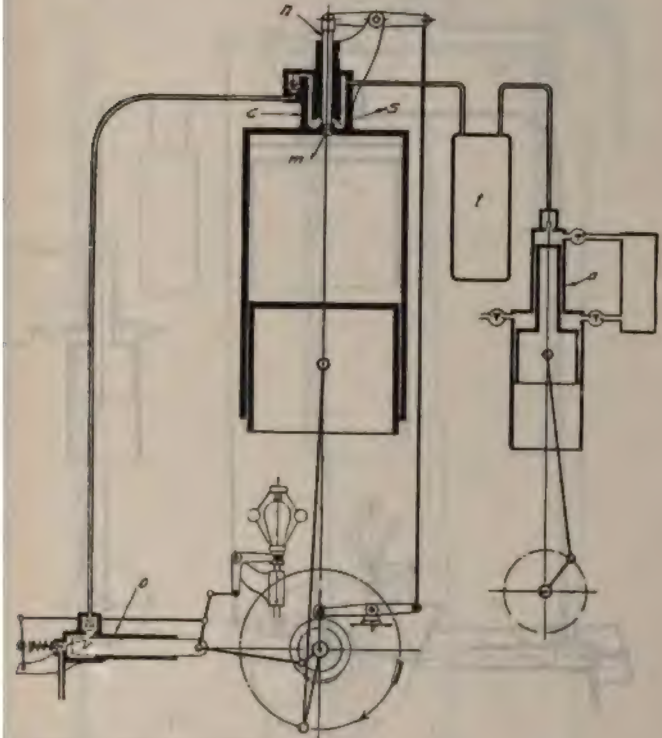


FIG. 4.

l to be injected. This pressure increase is about 250 pounds from
o maximum load, no arrangement having so far been made where-
s pressure can be automatically controlled; this must be done by
at the judgment of the engine operator.

ıe of the variations of the constant-pressure type of engine are the
ıé engine which is evidently an attempt to eliminate the rather
enient requirement of variable injection air pressures with varying
the De La Vergne engine which is a combination of the Diesel
ple and the hot bulb type as shown in figure 1; the Trinkler-Körting
; the Haselwander engine; the Atlas engine of the Diesel type;
ıe Covington engine of the same type.

Probably the latest of the Diesel type of engine is the Setz engine. The principle of air injection is as follows: the injection air is generated right in the engine at the moment the fuel injection is to take place. Figure 6 represents the injection period. The auxiliary piston *t* has just produced injection air of sufficiently high pressure to obtain the desired velocity through passage *k*, from whence it is directed into space *s* in such a way as to cause it to circle around its wall down towards nozzle *m*. At this moment pump *o* begins gradually to force the desired quantity of oil into space *s* at a velocity determined by the tension on spring *g*

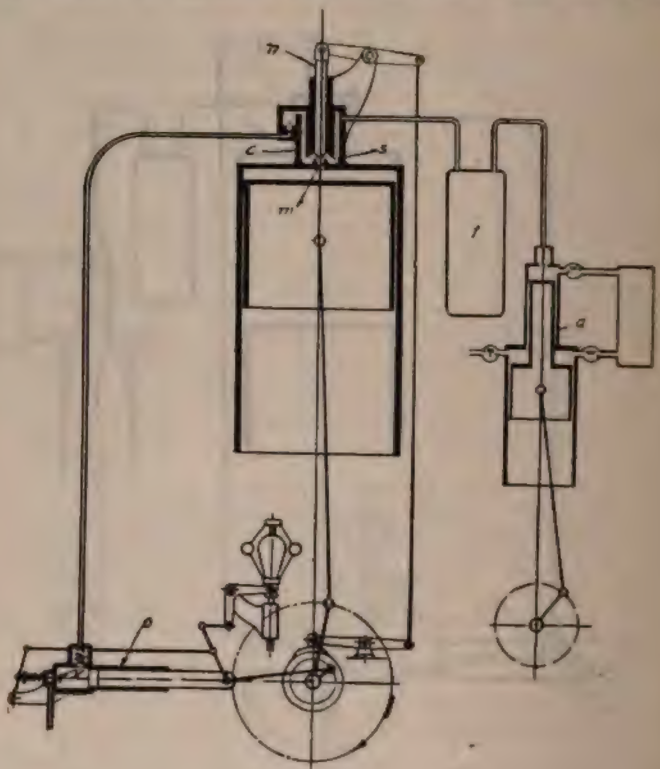


FIG. 5.

of valve *n*. The oil is therefore forced directly into the stream of injection air, the velocity of which is much higher than that of the oil, and the resulting abrupt acceleration of particle for particle of oil produces a complete spray at a minimum expenditure of energy. An important feature of this arrangement is the fact that valve *n* admits the fuel in the form of a very fine, cone-shaped film, thus distributing it equally over the whole surface of the injection air blast. This introduction of the fuel continues until oil pump valve *v* which is under control of the governor, opens, when valve *n* will automatically return to its seat and close off the oil passage, or rather the oil contained therein, from all contact with air until the next injection period begins. The functions of valve *n* are thus three-fold.

1. To determine the velocity with which the oil is to enter space *s*.
2. To distribute equally the oil introduced over the whole surface of e injection air stream.
3. To prevent the possibility of air and oil coming in contact with each her except during the injection period.

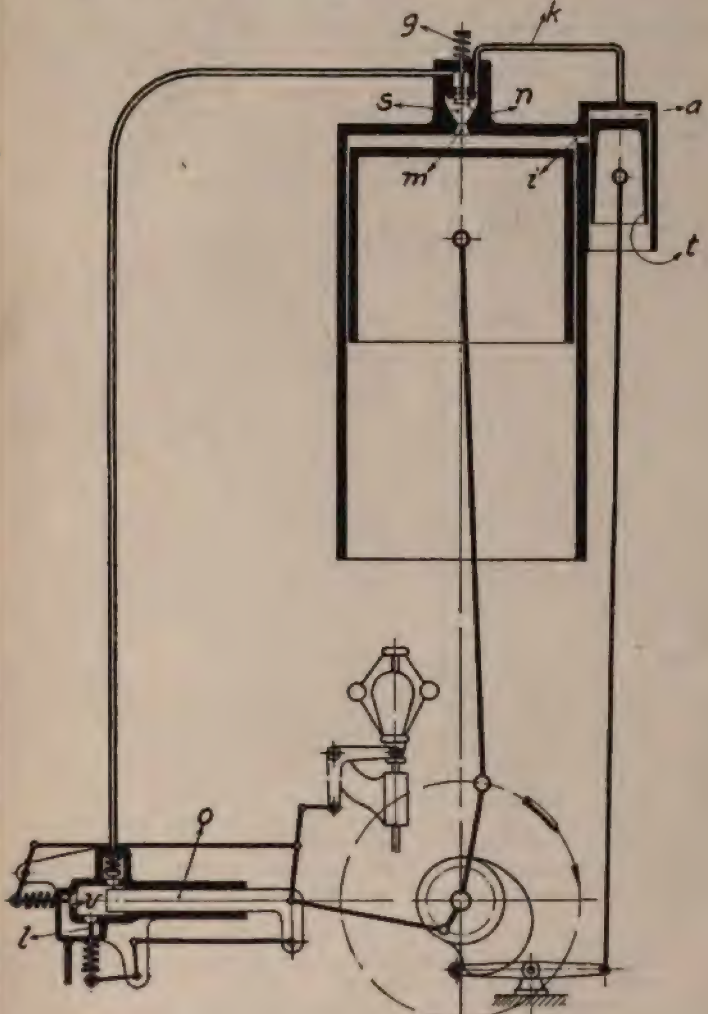


FIG. 6.

It is evident that in this engine the duration of the injection period is termined by the oil pump *o*; provisions must therefore be made to start mission of the fuel under all loads at the same point, relatively, to the sition of the main piston. This is accomplished by means of valve *l*, hich always closes at a fixed point of the pump stroke when the delivery

of oil begins and continues at a rate determined by the diameter and stroke of the plunger.

This engine is still in the experimental stage but promises to prove its practicability, and represents an engine of surprising simplicity.

DIESEL ENGINES. *Developments on the Continent.* (From an Engineering Correspondent.)—It is rather difficult at the present time for engineers and shipowners to keep fully in touch with all that is being done on the Continent with regard to the development of Diesel engines. The large Continental firms possess an advantage of long experience which it will be almost impossible to wrest from them, but perhaps that is not so important, in taking a wider view of the general aspect of the question, as the lack of knowledge regarding immediate future events which are likely to exercise so great an effect upon all branches of the shipbuilding and engineering industry.

Taking first the subject of the application of the Diesel motor to battleships, in England it is largely a question of vague rumors as to what is being done abroad, and so much exaggerated and impossible news has been circulated as to render it difficult for those who understand the obstacles to be encountered to believe that any actual progress is being made. In reality the position is that at the Nuremberg works an engine of six cylinders, to develop 12,000 horse-power has been designed, the intention being to install it in a large German battleship—not a Russian one as has been stated. The engine has been designed so that each set of three cylinders is self-contained and forms a complete machine capable of working independently; the first set has been constructed and has during the past week or two been running in the shops. So far as can be shown by so short an experience, the results have been satisfactory, and the favorable fact has been deduced that with a six-cylinder engine, instead of the power developed being 12,000 horse-power, some 15,000 horse-power will be obtained with ease—*i. e.*, over 2500 horse-power per cylinder. This engine is of the two-cycle double acting type of the usual Nuremberg construction. It is thus similar to those of 1500 horse-power and 1000 horse-power, which have been built for the Hamburg-America vessel and the Woermann liner.

To turn to another of the chief firms of Diesel engine manufacturers, Messrs. Sulzer Brothers, of Winterthur, Switzerland, it is well known that in this case it has been definitely decided to adhere to the single-acting principle for all Diesel engines. In these works a two-cycle four-cylinder stationary engine of 2400 b. horse-power has completed its trials, while a single cylinder marine engine of 2000 horse-power is now being constructed, also single-acting; all the castings have been made and the engine is at present in course of erection. It will be an entirely independent reversible engine, and will represent the largest power in one cylinder which has yet been built to work on the single-acting principle.

After five years' work on the subject Messrs. Sulzer have now completed a locomotive which is driven by a Diesel engine, and trials are to be begun very shortly. Perhaps in no application of the Diesel motor are the difficulties encountered so great, or the possibilities of economy so high, as in its employment for driving locomotives, and the results of these trials will be watched with great interest.

As indicating the cosmopolitan view which the German Admiralty is taking with regard to the question of Diesel marine engines, it may be mentioned that several German naval engineers have been sent to Messrs. Sulzer's works with the object of gaining a thorough experience in the engines constructed by that firm.

MISCELLANEOUS.

SHORT CUT TO THE PACIFIC.—The steady growth of the fleet-unit for Australian waters which is to form the nucleus of a local navy for the commonwealth, and the progress of the work of making the Panama Canal, proceed side by side in such a way that it may easily happen that Australia will have her orders completed by British shipbuilders at a time that will synchronize with the opening of the Panama Canal to maritime traffic. That this artificial waterway will be used freely by our merchant ships and warships, goes without saying, and if it is to be neutral in time of war it will make it much easier for our Colonial fleets to join hands with the mother fleet, as well as facilitate reinforcements being sent to many parts of our empire which will then be much less remote in point of access from our shores, than at present. The Pacific will, in fact, be brought within reasonable touch with our home fleets, and Australians may well feel a greater security after the new waterway is opened. The difficulties in the making of this canal have been stupendous; but the tenacity of the American statesmen and engineers has surmounted all obstacles, and the end is now plainly in sight; they are to be congratulated on the way their modern De Lesseps, Colonel Goettral, has stuck to his task and placed the accomplishment of such a creditable performance beyond all reasonable doubt. In the old days, a commission on the Pacific station often meant four, five or even six years in duration for British warships, owing to its remoteness. In three years' time the Panama Canal will be finished and the Pacific will be accessible in little more than a fortnight from England.—*United Service Gazette.*

THE GENERALSHIP OF ARMED MILLIONS.—The recent tension over Morocco has given rise to some extraordinary theorising in military circles, regarding the employment of enormous masses of troops in the field. The trend of thought in Germany at the present moment is to throw the whole of the able-bodied male population into the field, as one huge fighting machine, and as, according to recent statistics, this would mean the handling of about 1,380,000 men, it is impossible to conceive such a force as acting under a one-brain impulse. We are of opinion that our own regular army, as at present constituted and controlled, would be quite able to act successfully against even so gigantic a force as the above, providing always that we have an ally as a containing factor in the military problem. Our strategists will make a great mistake if they follow, as they have so frequently and foolishly done in the past, all the wild-cat theorising that emanates from the Continent. Far better that we should adhere closely to our own common-sense ideas, and thus retain what in the past has frequently been a pillar of strength to this country in times of great conflicts, than copy foreign methods that have so often proved disastrous. It is absurd to talk of armies of a million and a half, all engaging at one time, over a frontage of some three or four hundred miles, and we are surprised that so much attention is being paid to these vaporings. It should be remembered that there are certain necessities such as food, ammunition, and medical arrangements, required for the maintaining such a force; but what is more pertinent, is the fact that any commander who followed on the strategy of Moltke, would, with ordinary care, be able to dismember such a huge army at several points at the same time, and thus render the colossus impotent.—*United Service Gazette.*

AEROPLANES IN THE FRENCH MANEUVERS.—The *France Militaire* gives admission to an article concerning the use of aeroplanes in the maneuvers in Eastern France, which is calculated to bring the conception of the value of these craft into right proportions. The writer admits that the subject is delicate, but he asserts that imagination plays a considerable

part in estimating the value of the aeroplanes. He knows that these craft have astonished us, and are likely to astonish us much more. There can be no doubt of the boldness and courage of the pilots, and too much can scarcely be asked from them. Their duties are great and important, and they have the high courage of enthusiasm. The aviators have captured the public imagination, but the young pilots must not be flattered into thinking that they can win battles, as the artillery used to think. The writer in the *France Militaire* has studied the services of the aeroplanes minutely, and says that, instead of asserting that they have won battles, it would be well to ask if and how they could assist to win them. The latter is the point that has to be considered in the future. Their object is to dicover the situation of the enemy, but information is good and bad, the good being that which influences the decision of the chief. Cavalry officers have spent long years in learning how to gather this useful information, and yet they do not always possess the confidence of their chiefs. Is it to be imagined that the commander of an army or an army corps on the field of battle will accept with blind faith the information brought by an aviator. His personal responsibility is likely to forbid this. In maneuvers, operations are undertaken on the receipt of relatively doubtful information, but the same is not the case in war. In short, the critic thinks that aviators have yet to gain the confidence of their chiefs, and not to exaggerate their functions.—*Army and Navy Gazette.*

CONTRACTORS' CLAIMS.—It seldom happens that on public works carried out by contractors that the final accounts are agreed and settled up without any claims for extra payment under some head or other.

Claims may be made on account of alleged deviations from the contract during the progress of the work, or in respect of extra cost incurred by the contractors above that anticipated, due to alterations on the part of the engineer, or to difficulties and delays encountered which may or may not, have been beyond the control of the contractors. The form of contract and specification, if properly drawn, may, if strictly enforced, cover the employer's alleged liability, and place the whole onus on the contractors. Sometimes claims put forward by contractors are largely frivolous and vexatious, and are raised merely in the attempt to get as much out of the employers as possible. The contract may not have been remunerative, and an endeavor is made to finally come out on the right side, to a greater or less extent, by what can be got out of claims, often irrespective of the real merits of the case. There are contractors who, from the start of work, make it a special business to raise or manufacture claims on every conceivable opportunity, whether these can or cannot be substantiated wholly or in part. As a rule contractors' claims may be classed generally as follows:

1. Claims arising out of alleged alterations or non-fulfilment of the contract through no fault of the contractors.
2. Claims on account of delays or difficulties beyond the contractors' control.
3. Claims arising from alterations made as the work proceeds.
4. Claims made in the attempt to cover losses due to the contractors' mismanagement, oversights, or bad luck.
5. Indirect claims, or claims for consequential damages.
6. Frivolous and vexatious claims.
7. Petty claims.

Nearly all contracts give rise to some or all of the claims falling under the above heads. They may be further roughly sub-divided into:

1. Claims which the resident engineer cannot settle, and which should obviously be left to the arbitrator.
2. Claims the resident engineer should settle, if a reasonable settlement can be made.

3. Claims which only the resident engineer can and should settle, and which ought never to be carried to a higher authority.

4. Claims which ought never to have been made.

It is probable that under each division there may be items which ought to be withdrawn, which the contractors, if fair and reasonable, will readily withdraw. At the same time matters not infrequently arise in which the contractors are fairly entitled to some consideration which the resident engineer or immediately responsible official will not or cannot see. Some people are unable to see two sides of a question; some will haggle over pence and miss pounds.

A mistake often made on public works is the deferring of the settlement of many trivial matters, involving small sums of money, for months or even until the completion of the contract. Those on both sides of the fence are frequently equally to blame—neither side will budge. Of course, an important principle may be involved in a matter of small moment monetarily, and in this case it may be necessary and wise to delay settlement. A certain amount of the spirit of compromise over matters in dispute or differences of opinion arising during the progress of works is often equitable and needful. A delay in final settlement until the heat of argument has passed away may be judicious and wise.

Nevertheless the number of small and trivial matters held over until the end on many contracts becomes almost an absurdity. Contractors with an undue appetite for claims are inclined to prefer delay in order thereby to confuse the issue and so hope for an advantage. Moreover, time is a great softener, and by long delay many small matters which assumed comparatively great importance cease to do so, and thereby this class of contractor may obtain eventually what he is not really entitled to. These matters should, as far as possible, be settled up as the work proceeds, full particulars being kept of all items not agreed or withdrawn, so that the lapse of time shall not militate unfairly against either party.

On questions of fact no doubt can arise if the engineer's and contractors' representatives know and attend to their business. It is a good plan when a claim arises, or is likely to be made, for both sides to agree upon the facts and on the work done in those cases which are deferred or left to higher authority, so that when the principle involved is decided, there can be no doubt as to the basis of settlement or the amount fairly at stake.

To carry out work well, confidence in each other on the part of the resident engineer and contractors' representatives is essential. Neither should be seeking an advantage over the other. The contractors are, of course, there to make money, but to do so squarely and honestly under the contract. The engineer is there to watch the interests of the employers, to see fair play, to get fair work for fair payment under the contract and specification, and to render all reasonable assistance to achieve the speedy and satisfactory completion of the work.

A specification properly written endows the engineer with great powers. It is intended to give him the whip hand if required, and it sometimes is required. On the other hand, specifications are usually meant to be applied with reason and judgment, not losing sight of the principles of equity between decent and honorable men.

Day work is a fruitful source of dispute between engineers and contractors. In the hands of some contractors, it is not putting it too strongly to say that day work amounts to daylight robbery. This method of working should not be adopted unless circumstances render it unavoidable. It not infrequently happens that work has to be done for which no item appears in the schedule, or to which no schedule item can be fairly applied. Whenever possible, prices should be agreed upon between the engineer and the contractors. If the resident is a confident and strong man, this course can usually be adopted. As a rule, a resident is not empowered to alter a schedule rate, but he can, if in the position and exercising the authority

which ought to be his, make a new price, within limits, to meet particular circumstances not previously provided for. The contractors may decline to accept a price which the resident knows is a fair one and hold out for a too high a rate, or press the alternative of day work. The latter course is often pressed, but if the resident engineer is satisfied the work can be fairly done without recourse to day work, he may decline to allow it and pay a price on account, leaving the final settlement until later. In this case he would naturally take care that the payment on account was not too high.

Some resident engineers are very loath to settle prices, readily taking refuge in day work. It is perhaps less trouble, and by doing the work on the basis of time and material, he imagines he is getting rid of responsibility. The clerks of works or others can be instructed to return the time, and as long as there is a return, showing so many men so many hours, it matters little what the work is costing. The resident certifies for it, and takes refuge in the returns. It is common knowledge that when work is done and supervised, as a good deal is, in this manner the cost is often higher than it should be, and a longer time taken to complete it. A resident engineer who acts in this way is either partially ignorant or inefficient.

There are many causes which militate towards unnecessary cost in the execution of public works. It is sufficient to say here that one reason which tends towards the line of least resistance is that it sometimes happens the final accounts are subject in full detail to the review and scrutiny, as to prices and everything else, of an accountant's staff. These persons are very competent accountants, *qua* accountants, but are not engineers, and know nothing of the value of the work. It is as easy as A, B, C for a man who knows his way about to drive a coach-and-four through these people. Consequently, if a price is arranged, not being in the schedule, long, tedious and irritating explanations are asked for. Whereas, so long as hours, men and material appear in the accounts, the money checks out at schedule rates, and nobody asks why a job has cost 300*l.* which might, and probably ought to, have been done for 200*l.* Moreover, it sometimes happens that a certain sum has been sanctioned by a committee, and if the money be not spent, it is almost as awkward, in a sense, as having to ask the committee for an extra sum. If this happens, the resident may get a little more credit with his head office for saving than he loses if increased expenditure is incurred. Either the system or the committee are to blame for this. In any case, the tendency is opposed to economy.

A source of trouble with contractors' claims lies in the fact that even where a *bona fide* claim exists the amounts at first asked by so many contractors are nearly always considerably in excess of anything that can be reasonably substantiated. In fact, the total is a good deal higher than is expected or hoped will be allowed. It is made up in order to bear substantial reduction. Unfortunately, human nature is largely responsible for this mode of doing business, which is to be deprecated. Swollen claims become a part of the stock-in-trade of claim-seeking contractors. They wish to obtain all that is possible, not much minding how they get it. On the other hand, engineers are in some measure responsible for this custom, so frequently resorted to, of making up outrageous claims.

The idea fixed in the minds of many engineers (we do not refer to those acting in the capacity of arbitrators) is that contractors' claims, whatever the amounts and whatever the argument upon which they are based, must be substantially reduced. The merits of the case are lost sight of so long as a settlement can be reached at a figure well below the original claim. The engineer is anxious for a good reduction, and the smaller the proportion of the amount claimed for which he can settle the better he is pleased. Contractors know this. They soon learn to know the man they have to deal with, and make up their claims accordingly. At the same time, everybody knows many engineers who possess the faculty of distinguishing reasonable claims and settling matters fairly

ir merits, having, of course, due regard to contracts and specifications. such men it generally is to the contractors' advantage to confine to reasonable proportions, which can be substantiated both in ple and amount, rather than to ask for 200*l.* and be quite ready when d to accept, say, 75*l.*, or nothing at all.—*Engineering.*

NAVY AND SCIENCE. *Admiral Sir A. Moore's Reminder.*—At the ding meeting of the British Association at Portsmouth, the thanks association were extended to the mayor and corporation, and to mmander-in-chief (Admiral Sir A. Moore). The vote of thanks commander-in-chief was proposed by Sir William White, who said embers of the association had found even more than they had an-ed to interest and instruct them.

niral Sir A. Moore, in reply, said the navy was very glad to have e opportunity of entertaining the thinking men, the men of science, ey profited so much from their researches. Men of science provided in war time with facilities for quick destruction. They read a deal about *Dreadnoughts*, and they had seen some of the submarine torpedo-boats in actual working order. The material was, of very important, but at the same time, what was of far greater tance was the men who had to man the ships. They might design uild the most efficient vessels, but what good were they if they had od men to man and make the most of them? Here, he feared, we tending to fall into error. Certainly we lived in days of science, e must keep apace with the latest discoveries, but we must never that when the day of battle came they depended mostly upon the They must not think that beginning and the end of the training of ficer was the knowledge of scientific machinery, but the development characteristics required in time of war, and he felt rather strongly we were perhaps somewhat apt to ignore that undoubted fact.— *and Military Record.*

as been repeatedly urged that America should be kept out of cal-ons of the two-power standard. In the first place the inclusion of nerican fleet would be politically unwise, and secondly, there is every to anticipate that for some years to come ship construction on the side of the Atlantic will be limited. In the article which he has ontributed to *The Atlantic Monthly* upon the present position and cts of American naval power, Sir William White adopted this e towards the effort to drag America into our naval discussions. illiam White made no comparison between the British and Ameri-vies, and he explained he had taken this course advisedly because s one of those, happily a large and ever increasing number in both ies, who regard the question of war between the great English ng peoples as lying beyond the region of probability and therefore ng no discussion. As Sir William White pointed out, the recent ctory settlement at The Hague of the only important differences existed between the two countries emphasizes this belief. Both ies share the desire for the maintenance of an "open ocean," across commerce and communications can proceed in safety; of an "open for the entry of their manufactures into the great markets of ; and their supreme interest is centered in the maintenance of the of the world. By united action it lies in their power to insure the uance of peace to an extent which is possible to no other combina-f powers, and they wish to attain that desirable result without injury interests of other nations. In these circumstances the late director val construction, who for so many years has been in intimate touch the American naval authorities, gave it as his deliberate opinion was not only undesirable, but useless, to make comparisons of the e naval strength of Great Britain and the United States.—*Naval Iilitary Record.*

REAR-ADMIRAL N. C. TWINING, U. S. Navy.—The attention of the Bureau of Ordnance, Navy Department, has been drawn to a statement made by Dr. Charles E. Munroe in a paper read before the Interantional Congress of Applied Chemists, in London, 1909, to the effect that provision had been made to rework U. S. navy smokeless powder every three years. This statement has tended to create an erroneous impression, particularly abroad, and to cast an exaggerated and unwarranted suspicion on American powder, which it is desired to correct.

To understand the situation clearly, it is necessary to state that smokeless powder for the U. S. army and navy is made under government specifications prepared by a Joint Board of Arm and Navy Officers from results obtained after years of experimentation and exhaustive tests by ordnance and chemical experts. Every effort has been made to improve the process of manufacture and the bureau can state positively that the powder as now manufactured will, under normal conditions of storage, enjoy a life of from twelve to fifteen years, and possibly longer.

The bureau now has powder in service which is from seven to twelve years old and which is still in excellent condition as to stability; this powder was manufactured before certain improvements in the process of manufacture now in vogue were adopted; these improvements render certain a longer life of powder into the manufacture of which they have been introduced.

The bureau has established a reworking plant for the purpose of reworking such powder as may prove unsatisfactory; by the use of this process powder which it is necessary to condemn for any reason can be made over into new powder of the best quality at a small cost instead of being a total loss.

At about the time Dr. Munroe was preparing the paper above mentioned the bureau made marked improvements in the process of manufacture of smokeless powder by the introduction of a stabilizer. This has been acknowledged by Dr. Munroe as will be seen from the following copy of his letter on October 6, 1911, to Mr. H. F. Brown of the Du Pont Powder Company, which is published by the kind permission of Mr. Brown and Dr. Munroe:

EIGHTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, WASHINGTON AND NEW YORK, SEPTEMBER, 1912.

October 6, 1911.

Mr. H. F. Brown, Director Smokeless Powder Department, E. I. Du Pont de Nemours Powder Company., Wilmington, Del.

DEAR SIR: Replying to your inquiry regarding the statement made in my London paper in 1900, viz. "To insure stability, provision is made for reworking the powder every three years" I state that such frequent reworking of the powder has not been found necessary even with the older form of powder and that moreover, while my paper was being published, such improvements were made in the manufacture and stabilization of the U. S. powder referred to as to greatly improve its keeping qualities. The experience of the users of this powder and the results of the tests made indicate that the powder as it is now and has been made for some years will enjoy a life of from twelve to fifteen years and probably longer.

Yours very truly,

(Sd.) CHARLES E. MUNROE.

THE HYDRO-AEROPLANE FOR THE NAVY.—The success of Lieuts. T. Gordon Ellyson and John G. Towers in flying in a hydro-aeroplane down Chesapeake Bay from Annapolis to Buckroe Beach, Va., a distance of 145 miles, in 147 minutes, will justify Secretary Meyer in asking Congress in December for a liberal appropriation to equip the navy with airships of the amphibious class.

When the Secretary wrote his report a year ago, Mr. Eugene Ely had recently (on November 14) made a flight in a Curtiss biplane from a temporary platform on the forward deck of the scout cruiser *Birmingham*, and Mr. Meyer said in his report.

"The Department contemplates further experiments along these lines, with the belief that it will be necessary in the near future to equip all scouts with one or more aeroplanes to increase the distance at which information can be secured."

A hydro-aeroplane is an aeroplane fitted with attachments to facilitate the starting of the airship from the surface of water and its alighting on the same element. A Frenchman, M. Henri Fabre, was the pioneer of amphibious locomotion, making the first flight at Martinique on March 20, 1910. Mr. Glenn Curtiss had begun to experiment on Lake Keuka the previous year, but it was not until January 26-27, 1911, that in San Diego Bay he rose from the water, and after taking his course through the air settled down again on the surface of the bay with the ease of a gull. His hydro-aeroplane developed a speed of forty-five miles an hour on top of the water, and in the air it traveled fifty miles an hour.

On February 27 Mr. Curtiss flew from North Island to the side of the cruiser *Pennsylvania*, and the airship was drawn up from the water and placed on the forward deck, as if it were an auxiliary for scouting purposes. A week later Lieut. T. Gordon Ellyson was taken up with the aviator for a flight of one and a half miles at a speed varying from twenty-five to fifty miles an hour, Lieutenant Ellyson sitting on the pontoon rigged below the aviator's seat. From this position Lieutenant Ellyson could see bottom at a depth of twenty-five feet, and he afterward said that in clear water it would be possible to see from the hydro-aeroplane a submarine traveling under the surface. It was also the lieutenant's opinion that when the airship was moving at the comparatively slow speed of twenty-five miles an hour bombs could be dropped with precision from the pontoon.

Mr. Curtiss began his experiments at San Diego by attaching to his lower plane, at about the center, a float six by five feet and one foot thick, arranged at an angle of ten or twelve degrees. In front of this, about the place of the wheel in a land machine, he attached another float six feet wide, one foot from front to rear and six inches in depth, and ahead of that float he fixed a small elevating hydro-plane. He found the combination too cumbrous and substituted a single float twelve feet long by two wide with a depth of twelve inches, resembling a scow, curved upward at the bow and downward at the stern. The weight was only fifty pounds. Thus equipped the aeroplane ran over the surface of the water with hardly any disturbance and rose into the air quickly and smoothly.

As Lieutenant Ellyson became Mr. Curtiss's pupil the presumption is that the hydro-aeroplane used on Chesapeake Bay had the equipment which we have described. In one account of this remarkable flight by two men on land and water, which has never been equalled, it is said that near Buckroe Beach "the engine was stopped and the big hydro-aeroplane was allowed to settle on the water," and that then "the gear was changed to the propeller shaft and the machine was run ashore." Apparently enough speed was attained to drive her up on the sands. It is to be noted that a strong east wind prevailed during the trip along the west shore of Chesapeake Bay, and that the machine was sometimes flying seventy miles an hour.

It is obvious that the hydro-aeroplane could not take to the water when any kind of a sea was running. In the present stage of development it is a craft for use on inland waters or on bays when the surface water is not rough. Nevertheless, the value of the hydro-aeroplane as an auxiliary to naval vessels for reconnoissance and for conveying despatches, and for light transportation both in peace and war, cannot be seriously disputed. Its employment for damaging or destroying an enemy's ship with explosives may still be debatable.—*New York Sun*.

BOOK NOTICES.

"Submarines of the World's Navies." By Charles W. Domville-Fife. Published by J. B. Lippincott Company, Washington Square, Philadelphia, Pennsylvania.

The author ably outlines in his preface to this attractive, well illustrated and well arranged book, the field he endeavors to cover; he says "In the description of the submarine torpedo boats of the various naval powers, it has been the object to point out the differences of the vessels, types and clases; with the purpose of showing their fighting value and efficiency, and of giving an idea of their construction, without occupying undue space, or wearying the non-technical mind with the description of details which are common, in one form or another, to every submarine boat."

This book has the fault, an unavoidable one in any publication descriptive of so rapidly developing and changing a subject, of being some months behind the newest developments, and consequently is of little value to the naval expert. Its information, however, seems to be accurate up to about the last of the year 1909, and will enable the lay reader to obtain a good comparative idea of the attitude of the world's navies toward this newest type of craft, and of their progress in its development.

The brief communications in Part III, from some of the world's authorities on the subject, give the reader a correct impression of the true value and possibilities and also of the limitations and dangers, of this type of craft as seen by their designers and commanders.

The book is well written and extremely readable, and will doubtless prove itself interesting to a large section of the American public, as it treats of an up-to-date subject about which comparatively little has been published, and which has been surrounded with an air of mystery which is unfortunately, not wholly dispelled by the present writer.

R. H. Danforth.

"Studies, Military and Diplomatic, 1775-1865." By Charles Francis Adams; The Macmillan Company. Contents. *Military Studies.* The Battle of Bunker Hill. Battle of Long Island. Washington and Cavalry. The Revolutionary Campaign of 1777. The Battle of New Orleans. The Ethics of Secession. Some Phases of the Civil War. Lee's Centennial. *Diplomatic Studies.* An Historical Residuum. Queen Victoria and the Civil War.

A splendid work. The author is evidently on familiar ground, and the completed volume shows both familiarity with and careful study of the subjects under consideration. Facts and deductions therefrom are presented in a pleasing and delightful manner. The illustrative battles and military subjects are happily selected, making a book that must be of interest to the American people. To the military student this work will be of inestimable value and fulfils a long felt want.

The Diplomatic Studies must be of great interest to all patriotic Americans, dealing as they do with the greatest crisis in the history of our great

e. The book is pleasing and instructive, and after careful reading grets that there is not more.—Price, $2.50 net.

D. W. WURTSBAUGH.

Handbook of Wireless Telegraphy." J. Erskine Murray, D. Sc. edition, 1911): D. Van Nostrand Co.; $3.50.

book is written in a popular, and, for the most part, non-mathel style, and will prove exceedingly interesting to those who have slight knowledge of wireless telegraphy. In addition it will be of a work of reference to the specialist inasmuch as the author has ed together accounts of many types of comparatively little known tus and many interesting experiments which, up to the present time, een described only in scattered articles in the technical journals. In scriptions of the different so-called systems the author has quite lly taken the statements of the manufacturers for the attainments r systems. These, of course, will be taken with a grain of salt. In ases the distances given as having been covered by the appartus are made at night which, as is now known, gives no criterion of the excelof the apparatus. The book contains a brief history of the developof wireless telegraphy, including the early attempts at signaling withres, which led up to wireless telegraphy itself. A brief account is of various systems, the lesser known being described almost as com- as those which have a wider use. A curious omission in this par- is the failure to describe the present Telefunken quenched spark tus. Among the interesting experiments described are those of ll and Taylor with the steamer "Monarch" on the variation of re- current with the distance. Attention is also given to the experi- of Captain Wildman in Alaska on the measurements of received t. These were among the first attempts to apply quantitative methods eless telegraphic transmission.

following list of the chapter headings will give a good idea of the al covered in the book: I, Adaptations of the Electric Current to aphy; II, Earlier Attempts at Wireless Telegraphy; III, Apparatus in the Production of High Frequency Currents; IV, Detection of lived Currents of High Frequency by Means of Imperfect Electrical ts; V, Detection of Oscillatory Currents of High Frequency by Effects on Magnetized Iron; VI, Thermometric Detectors of Oscilla- urrents of High Frequency; VII, Electrolytic Detectors and Crystal- ectifiers; VIII, The Marconi System; IX, The Lodge-Muirhead n; X, The Fessenden System; XI, The Hozier-Brown System; XII, ss Telegraphy in Alaska; XIII, The De Forest System—the Poulsen n—the Telefunken System; XIV, The Lepel and Other Shock-excita- ystems; XV, Directed Systems; XVI, Some Points in the Theory of nd Jiggers; XVII, On Theories of Transmission; XVIII, World- Telegraphy; XIX, Adjustments, Electrical Measurements, and Fault g; XX, On the Calculations of a Syntonic Wireless Telegraph n; XXI, Tables and Notes; Appendix, Radiotelegraph Convention e Instructions.

L. W. AUSTIN.

"Internal Combustion Engine Manual." By F. W. Sterling, Lieutenant, U. S. N., School of Marine Engineering, U. S. Naval Academy.

A treatise on internal combustion Engines written primarily as a text book for midshipmen. The time allowed for this course is limited to about twelve lessons, hence the subject is very briefly treated.

In the foreword the author gives the following information:

"(a) The subject of fuels is first treated fully, this being the fundamental element that governs design and operation. These fuels follow in a natural sequence which order is preserved when carburetion is taken up in Chapter V.

"(b) The engine proper naturally divides itself into four systems: (1) fuel system, (2) ignition system, (3) cooling system, (4) lubrication system. These are treated in detail in the above order and in Chapter X the four systems assembled are illustrated by modern commercial engines.

"(c) Producer plants being closely allied to gas engines are given a short chapter at the end of the book."

2. The author describes the details of construction of the various parts of the engine in Chapter III, and in the next chapter explains the principles of action of the two- and four-cycle types. A more logical arrangement would be made if these subjects were treated in the reverse order.

In the early part of the text the heat balance of an internal combustion engine, and of a steam engine plant are very cleverly diagrammatically compared, and these two forms of motive power are generally compared. This should come later in the book, perhaps in the chapter that treats of the thermal efficiency of the engine.

With the above exception, the book is logically arranged, and more meat is given than in many other books of much larger size.

3. In the chapter on fuel systems only one of each type of caburetor is described. These are well selected, showing the difference in design required by the different fuels; and embody the principles of all carburetors.

The sketches of electric spark ignition being diagrammatic are very easily understood.

In the chapter on faults, the usual defects and their remedies are given.

There are well selected sketches, and brief descriptions of the various types of commercial engines including the Gnome engine for aeroplanes and the Knight engine for automobiles. It is to be regretted that the author did not go more into the subject of heavy oil engines, as it is a live subject, especially for marine engineers.

The various types of gas producers are described. Diagrammatic and detailed sketches to explain principles of operation and assembled drawings of modern plants are included.

The book is recommended to all officers preparing for examination or who find their duties will require them to know something about this subject.

The volume contains 145 pages, 4" x 7", and copies can be purchased from the author or through the Secretary-Treasurer of the Naval Institute; price, $1.75.

W. B. WELLS.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909.

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910.

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911.

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

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NOTICE.

The U. S. Naval Institute was established in 1873, having for its object e advancement of professional and scientific knowledge in the Navy. now enters upon its thirty-eighth year of existence, trusting as heretore for its support to the officers and friends of the Navy. The memrs of the Board of Control cordially invite the co-operation and aid of eir brother officers and others interested in the Navy, in furtherance the aims of the Institute, by the contribution of papers and communitions upon subjects of interest to the naval profession, as well as by rsonal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and assoiate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers atached to the Naval Service, shall be entitled to become regular or life embers, without ballot, on payment of dues or fees to the Secretary nd Treasurer. Members who resign from the Navy subsequent to joinng the Institute will be regarded as belonging to the class described in his Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1912.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1912. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

W. B. WELLS,

Lieut.-Commander, U. S. N., Secretary and Treasurer.

DECEMBER 1911

United States Naval Institute Proceedings

The writers only are responsible for the contents of their respective articles.

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Entered at the Post Office at Annapolis, Maryland, as Second Class Matter.

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PROCEEDINGS

ANNAPOLIS, MARYLAND

1873-1911

PUBLISHED MARCH, JUNE, SEPTEMBER AND DECEMBER OF EACH YEAR

Annual dues for regular and associate members $2.00, payable upon joining the Institute and upon the first day of each succeeding January. No initiation is required.

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SECRETARY AND TREASURER,

U. S. NAVAL INSTITUTE,

ANNAPOLIS, MARYLAND

BOOKS

PUBLISHED BY THE U. S. NAVAL INSTITUTE.

Proceedings of the U. S. Naval Institute, Annapolis, Maryland.

Published March, June, September, and December of each year. Annual subscription to the PROCEEDINGS for non-members, $3.00; single copies, 75 cents. Foreign postage, 50 cents.

Marine and Naval Boilers (1912).

By Lieut.-Commander Frank Lyon, U. S. N., attached to U. S. Naval Engineering Experiment Station, and Lieut.-Commander A. W. Hinds, U. S. N., Head of Department of Marine Engineering and Naval Construction, U. S. Naval Academy.

This book was prepared in order to provide an up to date text-book for the midshipmen at the U. S. Naval Academy. Plates and descriptions include the most modern boiler installations on naval vessels. The great gain in fuel economy made possible by the combination of gas analysis with intelligent firing is fully described. The causes of boiler corrosion with the practical methods of its prevention are included. The chapter on firing covers the use of oil fuel in addition to coal. A study of the book should furnish all the information necessary for the efficient handling of a boiler plant. The book will be ready for issue January 15, 1912.

CONTENTS: I. Historical: Classification of Boilers.—II. Fire Tube Boilers.—III. Water Tube Boilers.—IV. Boiler Fittings.—V. Boiler Accessories.—VI. Notes on Boiler Design.—VII. Heat and Heat Transfer.—VIII. Combustion.—IX. Coal.—X. Liquid Fuel.—XI. Firing.—XII. Draft.—XIII. Corrosion: Water Treatment.—XIV. Regulations for Care and Management.—XV. Boiler Tests.—Appendix and Tables.

The book is profusely illustrated by text figures and 14 folding plates.

8vo, about 400 pages. Bound in full cloth. Price $3.50, postpaid.

Mechanical Processes (1912).

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